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POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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See Page 361

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IMMENSE increase in production and use of Automobiles, Trucks and Tractors now that war is over, coupled with the most urgent demand for sales agents and motor mechanics, makes this your greatest opportunity to qualify easily and quickly to make big money.

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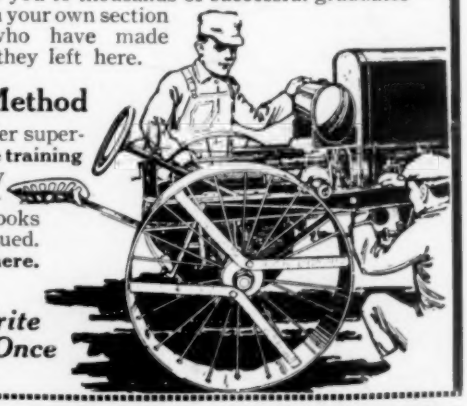

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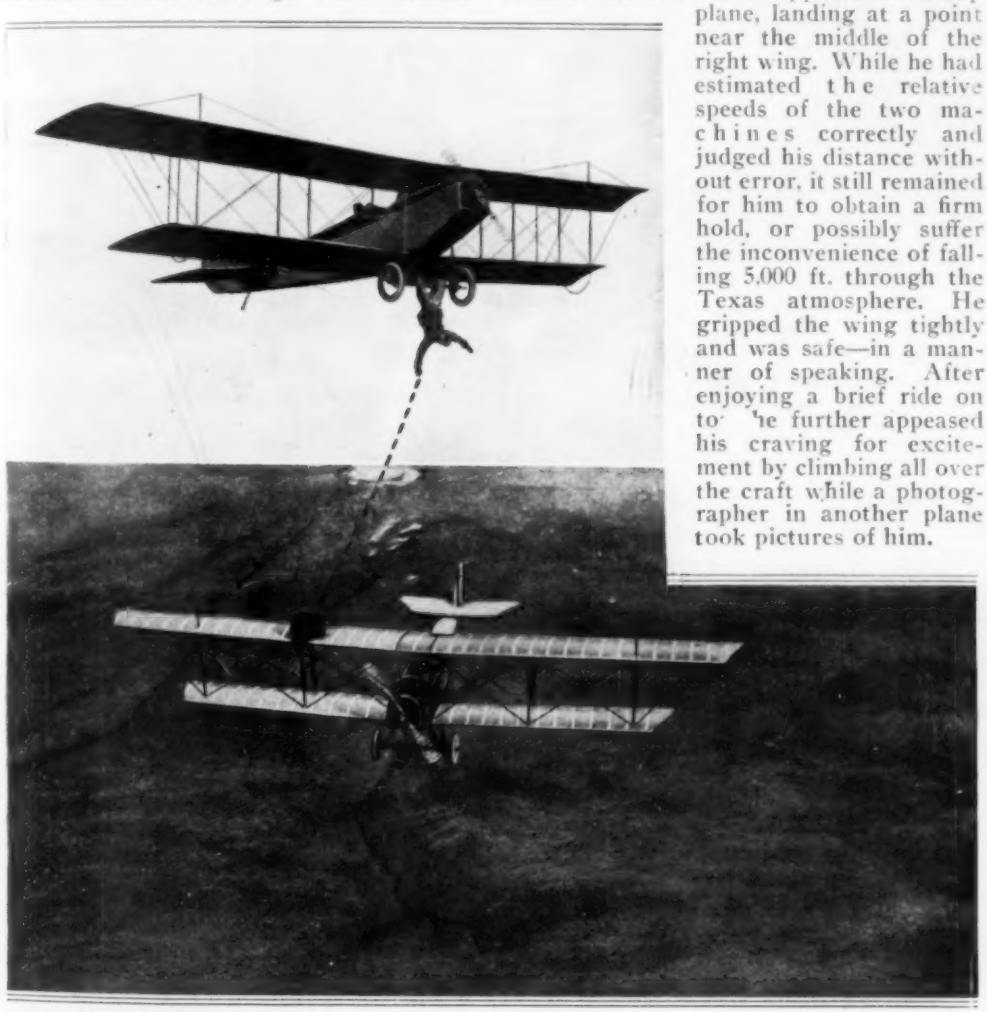
Vol. 31 MARCH, 1919 No. 3

Daring Flier Changes Planes in Mid-Air

FEW persons probably would care to emulate the aerial flip-flopping of a young lieutenant of aviation who recently accomplished the daring maneuver of changing planes while in full flight a mile above a Texas training field. Climbing down to the undercarriage of the machine in which he had left the ground as a passenger, he reached the horizontal bar of the landing chassis. Hanging to this, and executing acrobatic evolutions, he awaited the approach of a second ship flying at a lower level. As it came beneath him, he released his hold and dropped onto its top plane, landing at a point near the middle of the right wing. While he had estimated the relative speeds of the two machines correctly and judged his distance without error, it still remained for him to obtain a firm hold, or possibly suffer the inconvenience of falling 5,000 ft. through the Texas atmosphere. He gripped the wing tightly and was safe—in a manner of speaking. After enjoying a brief ride on to' 'he further appeased his craving for excitement by climbing all over the craft while a photographer in another plane took pictures of him.



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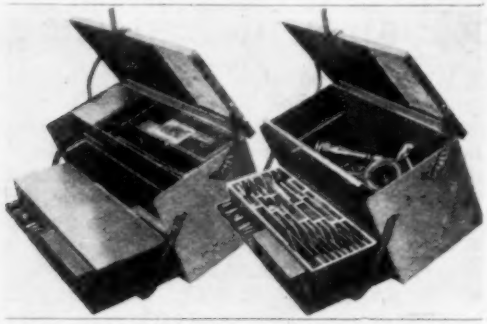
Accompanying the Pictures Above, Which Illustrate How the Maneuver was Accomplished, Comes a Note from the Photograph Agency to the Editor, Asserting: "The Photographs are Vouched for by Him (the Officer) as Being Authentic. We Have a Written Statement to This Effect"

ORDNANCE CAR'S "FIRST AID" IS COMPACT TOOL BOX

Tool boxes provided for use on all cars, trucks, and tractors of the Ordnance Department are not only complete in their equipment but are designed to give each

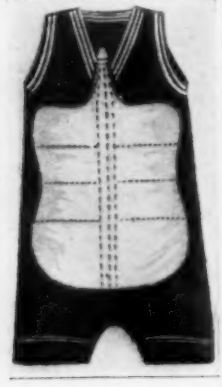


There Is Little Waste Space in This Tool Box When It is Completely Equipped for the Cars, Trucks, and Tractors of the Ordnance Department, and Every Item Has Its Own Compartment

tool or supply its own compartment. Besides the usual wrenches, screwdrivers, hammers, and pliers, each box carries a heavy jack, towing chains, a box of waste, scrapers for carbon removal, extra oil-cans, electric flash lights with extra bulbs and batteries, friction tape, extra magneto parts and generator brushes, head-lamp bulbs, and a small drawer of duplicate nuts and lock washers for all parts of the vehicle, each in its own little cell.

BATHING SUIT OF NEW DESIGN KEEPS WEARER AFLOAT

Of special interest to timid bathers is an unsinkable bathing suit outwardly resembling an ordinary swimming suit, but equipped with an inflatable portion on the inside of the front. This bladder is made of rubberized material which becomes waterproof on being wet. The bather, after immersing his body enough to wet the garment, inflates the bladder by blowing through a valve in its upper end. It is then capable of supporting persons weighing up to 300 lb. in the water, it is claimed.



RUDDER OF DIFFERENT TYPE ON HOG ISLAND SHIPS

Congestion of forges and foundries in the Hog Island shipyard led to an emergency design of rudder that proved to have some permanent advantages. Cast-steel and forged rudder frames being impossible of delivery in adequate quantity, a semibalanced type of rudder was laid out to use plates and standard sections. It is 23 ft. 10¾ in. from the coupling to the bottom of the rudder, 6 ft. 10 in. from the stock to the rear or after end, 3 ft. 5 in. to the forward edge of the balancing end, and 18 in. wide near the sternpost, tapering to 8 in. at the rear end. The only casting is used where the side plates are riveted at the top, serving as a coupling for the rudder stock. This form of rudder, being hollow, has a certain degree of buoyancy, relieving the strain on the bearings so that only two are used. A stern was also built up with a minimum use of castings by the substitution of steel plates wherever they could be used.

WATCH WITH GAS-PROOF CASE FOUND ON HUN CAPTIVE

Paralleling the famous "two sets of suspender buttons" of the German army equipment is a watch provided with a gas mask taken from a captured German soldier. A false case with a glass front is so constructed that when it is closed, with the watch inside, no corrosive enemy gas can enter the works and injure the delicate mechanism. The observed action of such gases on exposed articles indicates some reason in the German idea.

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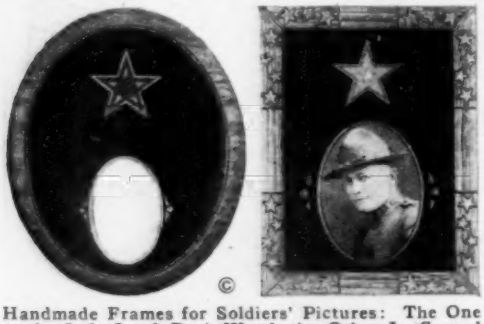
¶Mexican business houses are complaining that orders they send to manufacturers in the United States frequently are not acknowledged, and even their subsequent telegrams are ignored. American consular officers point to the importance to buyers in foreign countries of prompt information as to the receipt of orders and probable date of shipment.

BATHTUB MOVIE SHOWS FOR WOUNDED SOLDIERS

THESE men, who apparently are taking entertainment with their baths, after the fashion prevalent in ancient Rome, really are wounded American soldiers. Unable to go to any kind of a show, the Y. M. C. A. has brought one to their hospital at Cambridge, England. Here they sit constantly in water up to their waists, kept at 98° F. by continuous flow. This cleansing process has been entirely successful in healing serious septic wounds, many of which threaten the loss of a limb as the least of their consequences. The tubs are provided with air pillows and cushions, and a covered wooden lid which serves as a table or lapboard. With a fair-sized screen installed at one end of the hall, the men have been able to enjoy movie shows twice a week; and when the show is over, they simply switch out the lights, and the tubs turn into beds.

FRAMES FOR SOLDIERS' PHOTOS HAVE DISTINCTIVE FEATURES

A maker of artistic bric-a-brac has displayed unusual skill in fashioning frames of special designs for pictures of men



Handmade Frames for Soldiers' Pictures: The One at the Left Is of Dark Wood, the Other Is Carved and Gilded. The Stars are Embellished with Mother-of-Pearl

in the service. One of the rectangular frames is of gilded wood appropriately carved with stars and bars. The picture occupies an oval in the lower half of a dark-purple field, and above it is a blue service star with a gold border and embellished in the center with mother-of-pearl, or a plain gold star. Other frames, equally attractive, are oval and of dark wood, while the mat is of any shade suited to the color of the wall. In one frame, a red border just inside the frame surrounds the field, which is white.

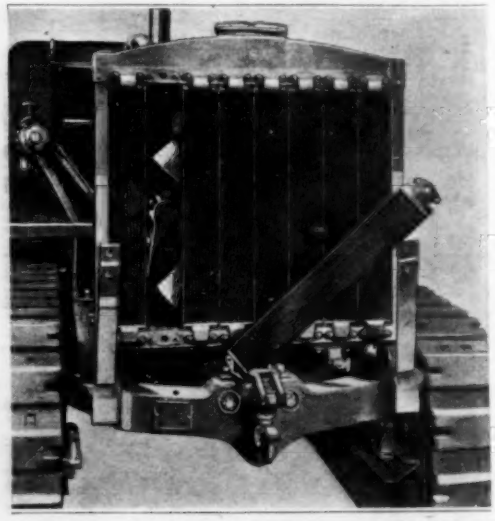
FLIER LANDS BIPLANE SAFELY AFTER LOSING MOTOR IN SKY

To an American lieutenant of aviation, in advanced training at an overseas flying field, belongs credit for making a forced landing in safety after wrecking his plane at an altitude of one mile. Collision with another machine tore the engine from the officer's craft, thereby destroying its balance. But for an exceptional display of coolness and ingenuity, the pilot's flying days would have been over. He grasped the one opportunity that offered itself, however, and lives to tell the tale.

At a moment when the plane was gliding on an even keel, he climbed onto the top of the fuselage at full length and in some manner managed, by continually shifting his weight, to restore balance sufficiently to prevent the craft from fluttering into a direct fall. The airman realized that the odds were all against him, but he kept his head as coolly as if he had been in no danger at all. While maintaining balance with his body, he also manipulated the controls and guided the machine earthward. At the conclusion of his long, harrowing descent, he negotiated a landing that is described as having been worthy of a finished pilot working under normal conditions.

SECTIONAL RADIATOR AIDS TRACTOR REPAIRS

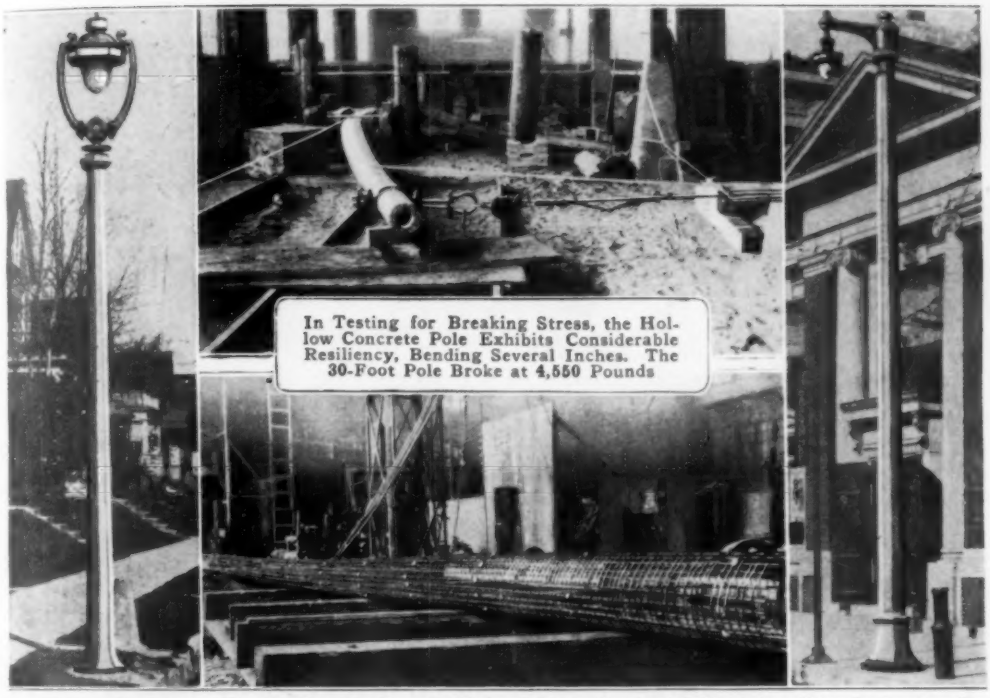
Radiators of artillery tractors, besides being protected by armor plate, are made in sections for quick removal and repair. Each sectional unit has cast-iron headers top and bottom, with posts which connect with the circulation system when the sections are bolted in place. Vertical steel channels connecting the iron headers give rigidity and strength to the sections. The cooling capacity of the whole radiator is sufficient to handle its duty with one section cut out. The damaged section may be removed, solid gaskets substituted for the pierced ones to stop the flow of water, and the dead section replaced. This is done to prevent the fan from pulling an excess of air through the vacant spot in the radiator. The change



A Radiator Constructed in Sectional Units Makes It Possible to Repair the Cooling System of This Artillery Tractor in 10 Minutes

from an injured section to a new one, however, takes only about 10 minutes.

¶ Potash from the extensive deposits of Alsace is suggested as a valuable ballast cargo for returning American ships. The supply is estimated to be adequate for America's annual need of 500,000 to 600,000 tons.



In Testing for Breaking Stress, the Hollow Concrete Pole Exhibits Considerable Resiliency, Bending Several Inches. The 30-Foot Pole Broke at 4,550 Pounds

The Hollow Concrete Pole may be Made Ornamental as Easily as Plain

The Reinforcing Cage is Made of Long Steel Rods Bound with Wire and Tied at the Intersections. When It Is in the Rotating Mold the Centrifugal Force Drives the Concrete into Every Crevice

Here Is Another Example of Simple, Yet Ornamental, Lighting Standards

ICELAND RIVER TO OPERATE BIG POWER STATIONS

Six power stations planned for early construction in Iceland will take from the Thjorsa, the island's largest river, a total of 1,114,000 hp. This stream, from 5,000 to 8,000 feet wide, has three important tributaries that drain the southern part of the country. The slopes here are gentle and development possibilities favorable. Climatic conditions are not severe, and the absence of ice difficulties, rafting of timber, and organized fisheries simplify the power company's problems. The production of chemical fertilizers and the nitrates and sulphites of ammonium is suggested as one use for the power developed, as the country abounds in sulphur deposits. For commercial and lighting purposes, electric current can be delivered at Reykjavik, less than a hundred miles distant, at a reasonable cost.

¶Mixtures of lime and coal dust are found to form excellent plant fertilizers. The lime accelerates the normally slow process of the soil in extracting carbon dioxide. The coal dust may be had as a colliery waste.

ROTATING CONCRETE MOLD FORMS HOLLOW POLES

Molding concrete shapes to meet special requirements is a problem more commercial than mechanical. By its very nature concrete finds no difficulty in filling any mold. Hollow concrete poles have been previously used in a limited way, but a commercially practical and economical production method is a recent development. The long horizontal mold is split longitudinally into two parts. In this mold is placed the reinforcement, a cage of longitudinal steel rods bound with wire and tied at the intersections. The wet-mixed concrete is poured in after the halves of the mold have been bolted together. The mold is clamped in a machine consisting of a tube that is rotated at a gradually increasing speed, and the centrifugal force compacts the concrete against the wall of the mold so strongly that all interstices of the reinforcement are filled and close cohesion attained. The action also separates the surplus water from the mixture and it escapes at the large end of the mold, leaving a concrete so compact that the pole, after having been given a special steam treatment, may be

safely removed in a short time. On a 30-ft. pole, with 7-in. top and 14½-in. butt, weighing 1,900 lb., tests made by applying pulling stress two feet from the top indicated a safe load of 4,050 lb. The pole broke at 4,550 lb., bending more than 13 in. before failure. The process is applicable to poles of practically any size, ornamental or plain. It is therefore useful for making telegraph, telephone, and signal poles, and electric-light standards, which may be as elaborate as desired.

NEW INVENTION MULTIPLIES CAPACITY OF PHONE WIRES

An achievement more extraordinary by far than making two blades of grass grow where one grew before, is the sending of five telephone conversations simultaneously over one pair of wires where but one conversation could travel before. The new apparatus, or system, which makes this feat possible is known as the multiplex telephone, a report on which has recently been given to the government and which marks a new epoch in the history of communication by wire. The new invention also makes it possible to send 40 telegraph messages simultaneously over one pair of wires, or they can be used in part for telephoning and in part for telegraphing. Ten conversations can be carried on over two pairs of wires which formerly could be used for a maximum of three conversations by means of the so-called "phantom circuit." Tests covering several weeks have been made of the system on a Baltimore-Pittsburgh line and have been pronounced successful in every way.

To carry five conversations over a single pair of wires it is necessary to send over the latter five different electric currents at the same time, and to provide means so that at the ends of the wires these currents shall be completely separated and go to their respective instruments. This is done by adding to each ordinary telephone current a carrier current of definitely higher frequency, the differences in wave lengths being adjusted to the separating devices at the receiving end. An improvement of the audion forms an important part in this remarkable apparatus, which will be installed on all long-distance lines. The cost and other factors make its application to short, local lines impractical. The invention will enormously increase the capacity of existing lines for telephone and telegraph service.

WIRE APRONS OF SKY INJURED MORALE OF GERMAN FLIERS

Sky aprons, consisting of fine steel wires suspended from horizontal cables supported between kite balloons, constituted an important part of the aerial defense system of London in the latter months of the war. It will be recalled that in April last year Popular Mechanics briefly described the anti-aircraft nets protecting Venice from Austrian bombers. At that time censorship withheld many details of the plan. It is now permissible to state that aerial aprons owe their invention to the British, who were the first to use them.

Balloons were sent up in groups of three or more to different elevations. The apron of wires they supported might be likened to certain Japanese beaded portières, except, of course, that the individual strands were spaced several yards apart and weighted with plumb bobs.

One of the most beneficial effects of the scheme was its pronounced influence on the morale of German airmen, who knew not where they might encounter the menacing wires. Striking one of them while flying at high speed might have serious consequences. It might cripple one of the controls, wrap around the propeller, saw through a spar, or, if it happened to be one of the main anchor cables, shear off a wing. The aprons are said to have spelled the doom of a number of night bombers and to have caused others to make forced landings.

In guarding London, the atmosphere was divided into three defense strata. Between the ground and a certain elevation the aprons gave protection. The artillery barrage formed a curtain of deadliness across the middle area. Above that were the night-duty fighting planes of the Royal Flying Corps, waiting the chance to attack.

PHONOGRAPH WITH GLASS HORN HAS BETTER TONE, IS CLAIM

An innovation in phonographs is an instrument equipped with a horn of beveled mirror glass. The claim of the makers is that the horn of a talking machine best amplifies the tone when its surface is smooth and rigid, hence one of heavy glass is preferable to one of wood or metal. Furthermore, the glass amplifier adds much to the attractive appearance of the instrument when the front is open.

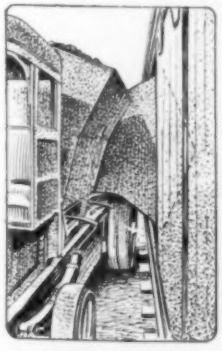
Tent Menders, Employed by a Fruit Growers' Association in California, Repairing Tents Which are Used as Covering While Fumigating Fruit Trees: This Association Has Enough Canvas to Cover All the Trees in a 10-Acre Orchard at Once

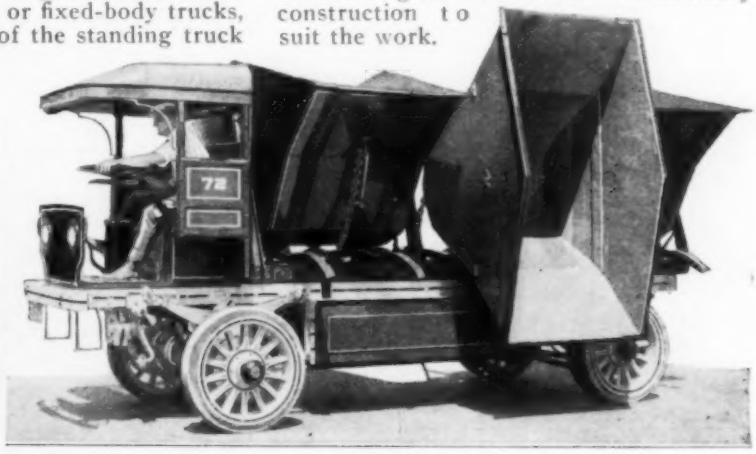
TRUCK DUMPS GRAIN LOAD IN FREIGHT-CAR DOOR

An electric truck, used for hauling grains and feed, has a side-dumping body so designed that each of the three independent sections fits a standard freight-car doorway. As the driver pulls up alongside a freight car, he tips the first section of the body directly into the car door, and it deposits its load on the floor of the car. The first section is righted, the truck moved slightly forward, and the second section dumped, followed by the third. Two-thirds of a section load is emptied automatically, the rest being shoveled out by a man in the freight car. A considerable labor-saving results over the methods of shoveling a full load from horse-drawn wagons or fixed-body trucks, and the idle period of the standing truck is greatly reduced.

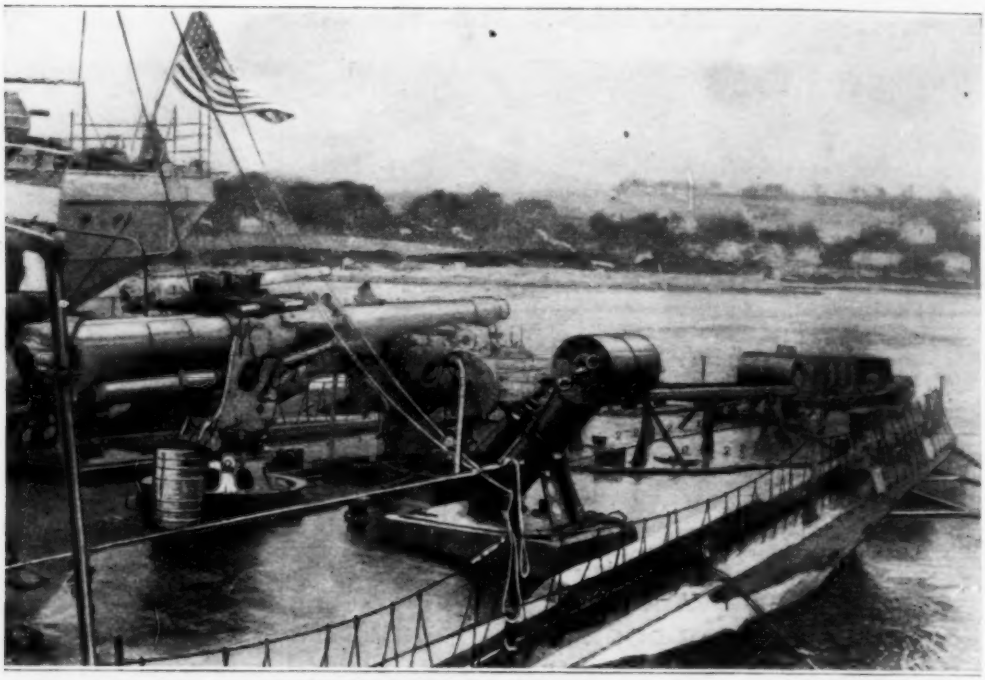
TENT REPAIRING A BIG TASK IN WESTERN FRUIT LANDS

Tent repairing which has nothing to do with circuses, camping, or army life, is an industry conducted on a large scale in southern California. The tents in question are used in covering fruit trees while they are being fumigated. One coöperative association of fruit growers has enough canvas to cover all the trees in a 10-acre orchard at once—much more, it is said, than is owned by any circus company. With so many tents in use there is much mending to be done of tears, and holes eaten by the acid fumes. This association employs three to five tent menders from four to six months each year. They are provided with sewing machines which are of heavy construction to suit the work.





As the Sketch at the Left Indicates, This Truck Dumps Its Load of Grain Directly upon a Freight-Car Floor, the Body Sections Tilting into the Car Door. The Driver Does the Tilting from His Seat, Emptying the Truck in a Hurry



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Visible on the Quarter Deck of This United States Fighting Vessel Are "Ash Cans" Leashed to a Launching Rack, a Mortar Loaded with a Depth Bomb, and a Four-Inch Gun—All Deadly Enemies of the U-Boat

U-BOAT BEATEN BY Y-GUN AND "ASH CAN"

AS is known to the whole world, the submarine menace was not a mere bugaboo. For a disheartening period it threatened to bleed the allies and throw the balance of power in favor of the Hun. The defeat of the U-boat was, therefore, a triumph of utmost importance. And for making this possible, credit is due in great measure to the depth bomb, or the "ash can," as it is known in naval vernacular.

Those skilled in the genealogy of ordnance might trace the history of this deadly weapon back to the early days of fishing, but so far as the landlubber is concerned, the depth bomb as now constituted is peculiar to the great war. Essentially it is a steel drum loaded with a 350-lb. charge of T. N. T. At one end is a timing dial, and at the other a safety fork. The former consists of an indicator hand and a metal ring on which various depths from 40 to 150 ft. are stamped. By turning the pointer to one of these numbers, adjustment is made of a delicate spring which affects an internal diaphragm that is acted upon by the pressure of the water. When the bomb reaches the predetermined depth, the detonator is released, causing it to explode. Before it is launched, however, the so-called safety fork, which normally prevents

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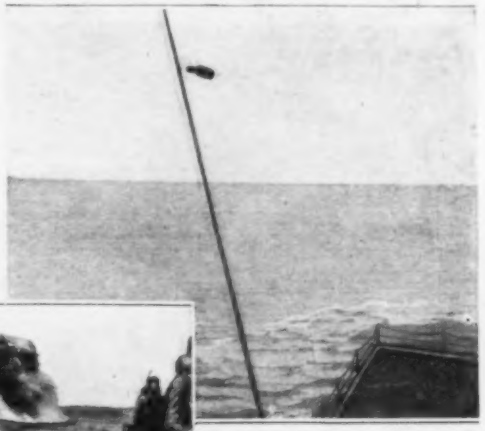
This Gives a Close-Up View of One of the Depth-Bomb Mortars a Split-Second Following Its Discharge. The Firing Chamber, It will be Observed, is Attached to the Top Side of the Barrel

accidental discharge, is drawn out, so that the interior mechanism is free to operate.

The effective radius of a depth bomb is about 150 ft. In other words, it will cripple if not crush a submarine lurking within that distance at the moment of discharge. When once released, it falls like a plummet to the desired depth and explodes. For that reason it cannot safely be dropped from the stern of other than a fast-moving vessel, and even the latter is frequently lifted half out of the water by the terrific force of the concussion. In the early months when depth bombs first began to be used by our sailors, the sterns of the lazy-moving craft sometimes were blown off. Not a few bobtailed boats were towed to dry docks in 1917.

In action, three methods were commonly used for launching depth bombs. In the beginning they were merely thrown over the stern. Then an inclined rack, on which eight or ten of them could be leashed securely, was adopted. When an ash can was to be dropped, the ropes holding the sternmost one were cut, allowing it to roll off the end of the structure and fall into the water. Finally an improvement on this method appeared in the form of a lever-controlled rack manually operated. The merit of this arrangement, however, was chiefly



A Depth Bomb, Fired by a Mortar, on Its Way to Crush a U-Boat: The Rod at the Rear Is the Arbor to Which It is Clamped

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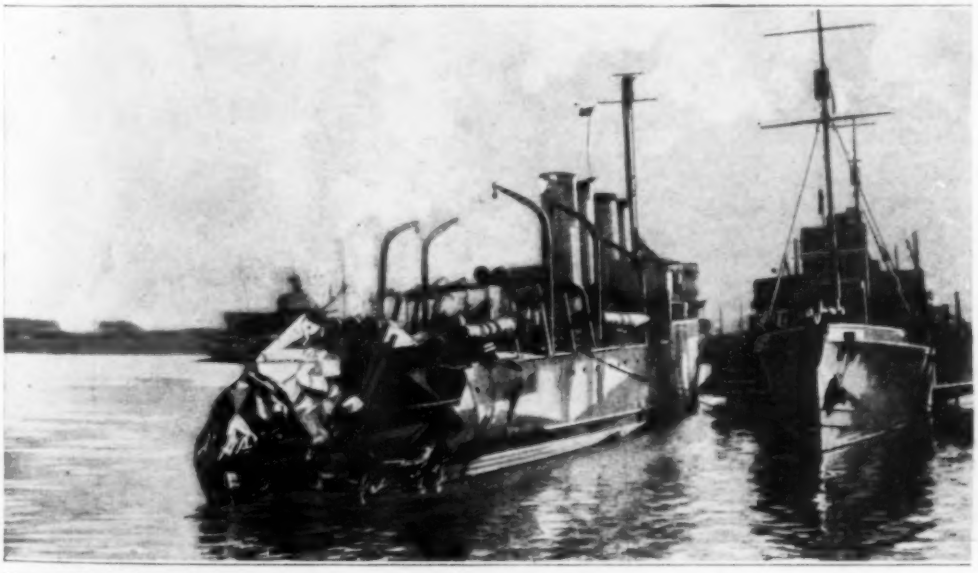
A Mountain Peak of Water Rises into the Air Following the Terrific Explosion of a Depth Bomb beneath the Surface



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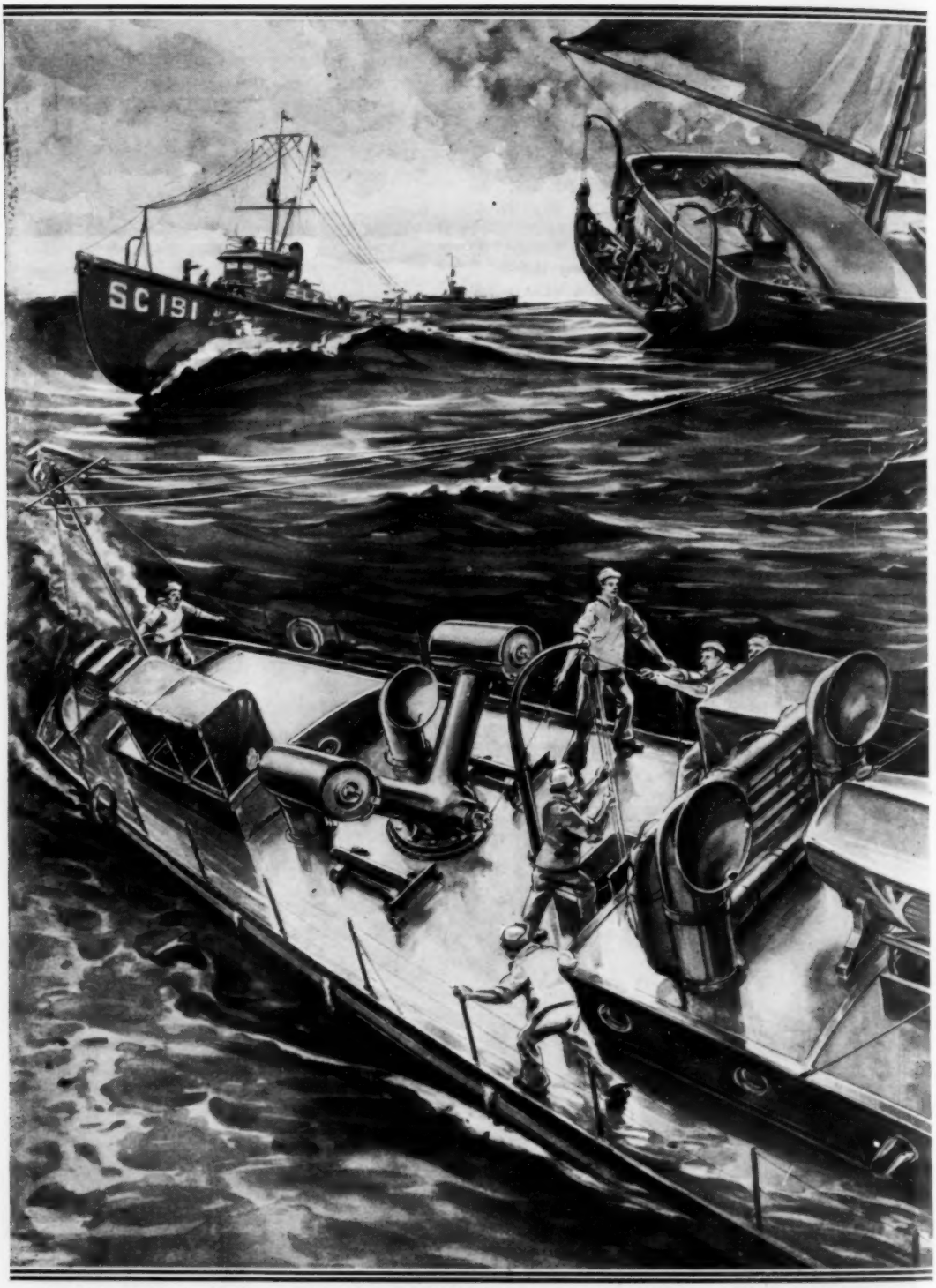
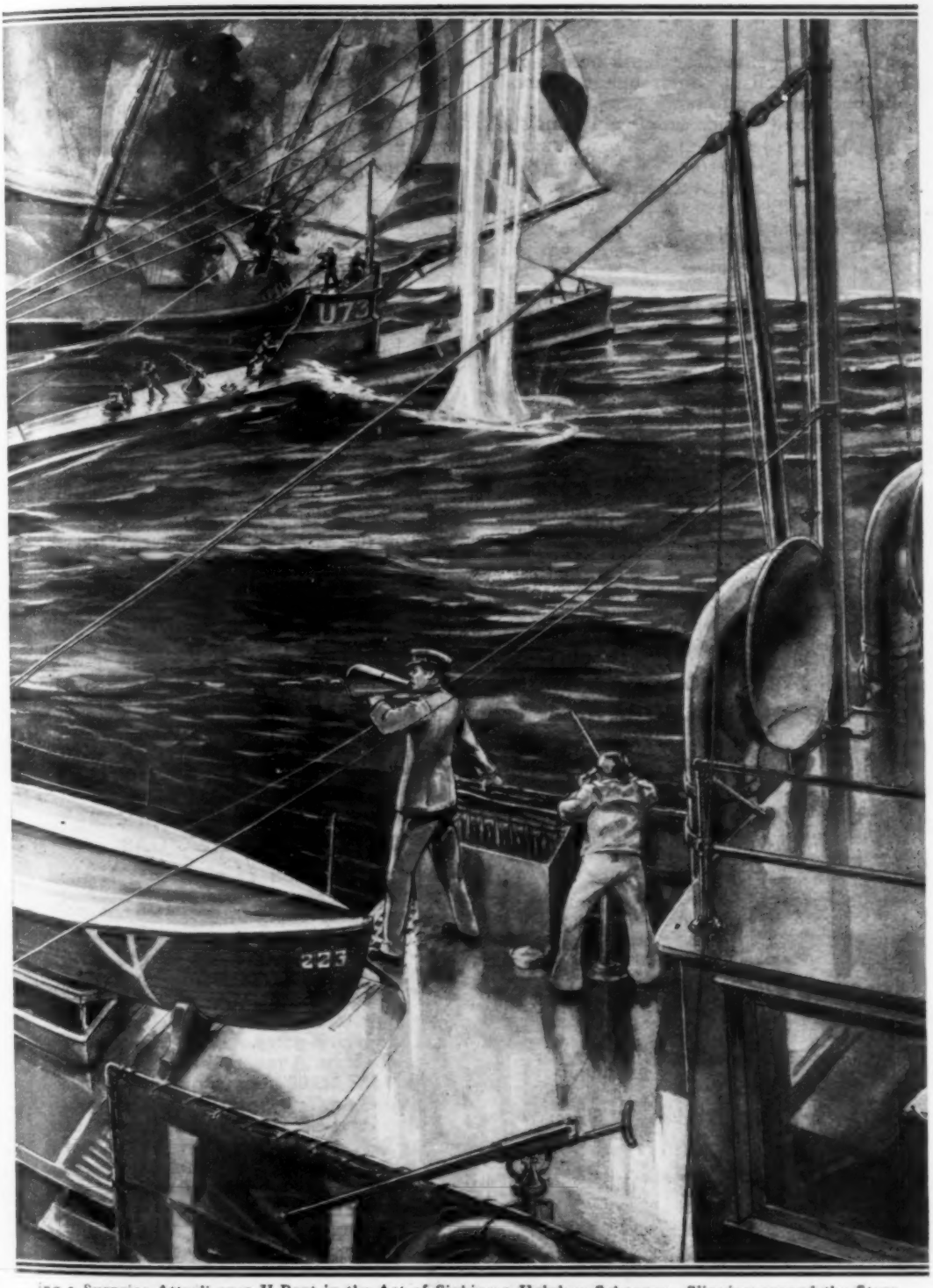
Showing the Condition of the United States Torpedo Boat "Manley," Whose Stern was Demolished by the Explosion of Depth Bombs That Were Aboard When It and a Merchant Vessel Collided: The Accident Was a Tragedy, for Many Lives were Lost on Both Ships



Sacrificing Little in Realism and Detail for the Sake of Action, the Artist Depicts a Thrilling Moment dur After Approaching from the Port Side of the Three-Master, Two American Submarine Chasers are Getting Has a Machine Gun Trained on the U-Boat's Deck. In Studying the Arrangement of the Near Chaser of the Quarter-Deck. Leashed beneath It to the Deck Are Extra Arbors, While Immediately Forward Is the the Inclined Rack from Which Depth

330



ing a Surprise Attack on a U-Boat in the Act of Sinking a Helpless Schooner. Slipping around the Stern, into Action. "S C 191" has Overshot the Hun with Its Three-Inch Piece, While the Craft in the Foreground It will be Observed That the Y-Gun, Ready to Discharge Its Depth Bombs, is Situated in the Middle Davit with Which Reserve "Ash Cans" are Raised through the Hatch. Abaft the Hatches will be Noticed Bombs are Launched over the Stern

one of convenience, for depth bombs cannot be dropped at too frequent intervals without countermining.

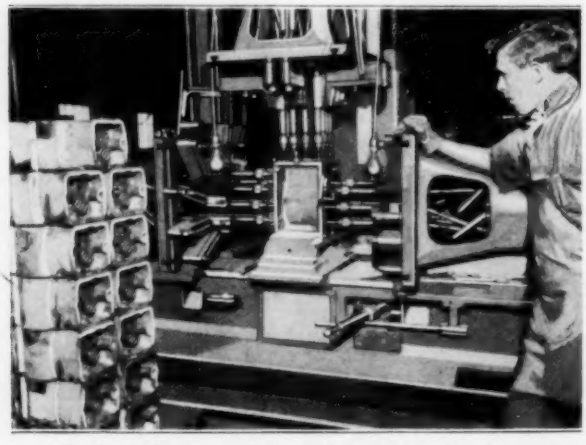
The second device employed consisted of the so-called Y-gun, an instrument shaped like the letter "Y," having two barrels placed at about right angles. This was ordinarily mounted crosswise in the middle of the after gun deck of a "sub" chaser and used for its firing charge a blank 3-in. cartridge. It hurled two bombs, one to starboard and the other to port, a distance of about 150 ft. Lastly, there was a squatty mortar that was employed usually on vessels other than chasers. Guns of its type were mounted on deck, at each side of a boat, and were of greater range than those of the aforementioned kind. The firing chamber consisted of a cylinder attached to the top side of the mortar's barrel. In each instance arbors were clamped to the depth bombs for gun use. Thus the scheme was essentially the same as with the better-known trench mortars, which also fired bombs with arbors attached.

The stern rack and the Y-gun enabled our chasers to employ an effective form of attack. Pursuing a U-boat, one of these craft raced to the point where the periscope was seen to disappear beneath the surface. In as rapid succession as safety permitted, ash cans timed for different depths were released at the stern. At short intervals the Y-gun hurled bombs to each side. As far as possible, the course of the U-boat was followed. This not availing, the chaser circled the area under suspicion.

It is not difficult to understand the logic of the system when the effective radius of the depth bomb and the range of the Y-gun are considered. A missile was dropped astern, for instance, and a moment later the Y-gun hurled two others 150 ft. from each side of the ship. Thus a triangle, with the first-launched "can" as its apex, was described. The effective area of each bomb slightly overlapped that of the other two. Therefore the force of the three explosions covered a triangular area that, roughly considered, was 600 ft. across at its widest part and of nearly equal height.

DRILLS FIFTY HOLES AT ONCE AT THREE ANGLES

A multiple-spindle drilling machine, cutting 50 holes at a time from three directions, is used in drilling cast-iron bodies for gas meters. The machine drills at high speed 36 holes horizontally, from opposite directions, and 14 vertically from above. This application illustrates the versatility and flexibility of the properly designed gang drill, whose limit of multiple performance probably has not yet been reached. Drilling all the holes in a part at one operation is now common practice.



Multiple High-Speed Drill Bores 50 Holes in One Operation from Three Sides. This Super-Gang Drill is Used on Cast-Iron Gas-Meter Bodies

LEAKAGE FROM PIPE LINES WASTES NATURAL GAS

Poor construction of pipe lines is the cause assigned for the loss in one year of natural gas valued at $9,000,000, in two states alone. Fuel-administration figures for a group of Kansas and Missouri cities and towns show a waste of 27 to 73 per cent of the gas delivered to the city gates. From September 1917 to August 1918, a total of 9,557,143,000 cu. ft. of gas was delivered, and only 5,679,256,000 reported as sold, a discrepancy of 3,877,887,000 cu. ft., or 40.58 per cent. While the wholesale companies and the distributing companies, which buy from them on a percentage basis, blame each other for the waste, checking of all wholesale meters in the district by the Bureau of Standards is relied upon to locate the responsibility and lead to elimination of the big loss.

This Five-Ton Artillery Tractor has Emerged from the Swamp and is Ascending a 100-Per-Cent Grade to the Road, Merely as a Test

SWAMPS, BUMPS, AND GRADES USED IN TRACTOR TEST

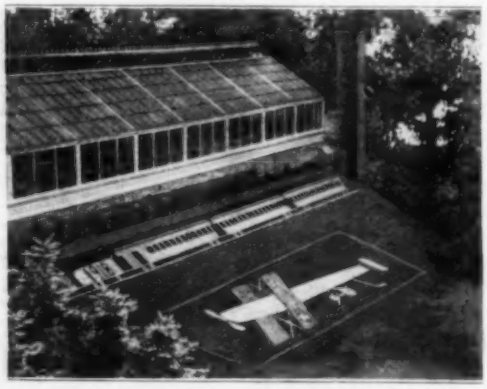
Running over a stretch of rugged ground called by courtesy a road, down a 100-per-cent declivity, across a swamp, and up an equally stiff grade on the other side, is a sample of the tests to which military tractors were subjected before delivery. A manufacturer of five-ton artillery tractors put every new machine over this route. Sometimes a tractor was tipped over by tackling the grades at too oblique an angle, and had to be pulled right side up by another machine, usually in undamaged condition. Severe as the test seems, conditions of military use certainly were no easier.

SALE OF ICELANDER'S VESSEL ENDS PLANS FOR SHIP LINE

An unexpected turn of events prevented the establishment of the Iceland-American steamship line proposed some time ago. It will be recalled that a voyage from Iceland direct to New York was made by an Icelandic vessel, and that there was much popular interest in the event because it was said to have been the first ship to make this trip since the days of the Norsemen. At the time the boat arrived, ships of all sorts were at a premium, and while here the captain and owner received such a flattering offer for his craft that he abandoned his former plans and sold out. It is said that his profits exceeded what he could have made in many trips.

AEROPLANE REPRODUCED IN FLOWER BED

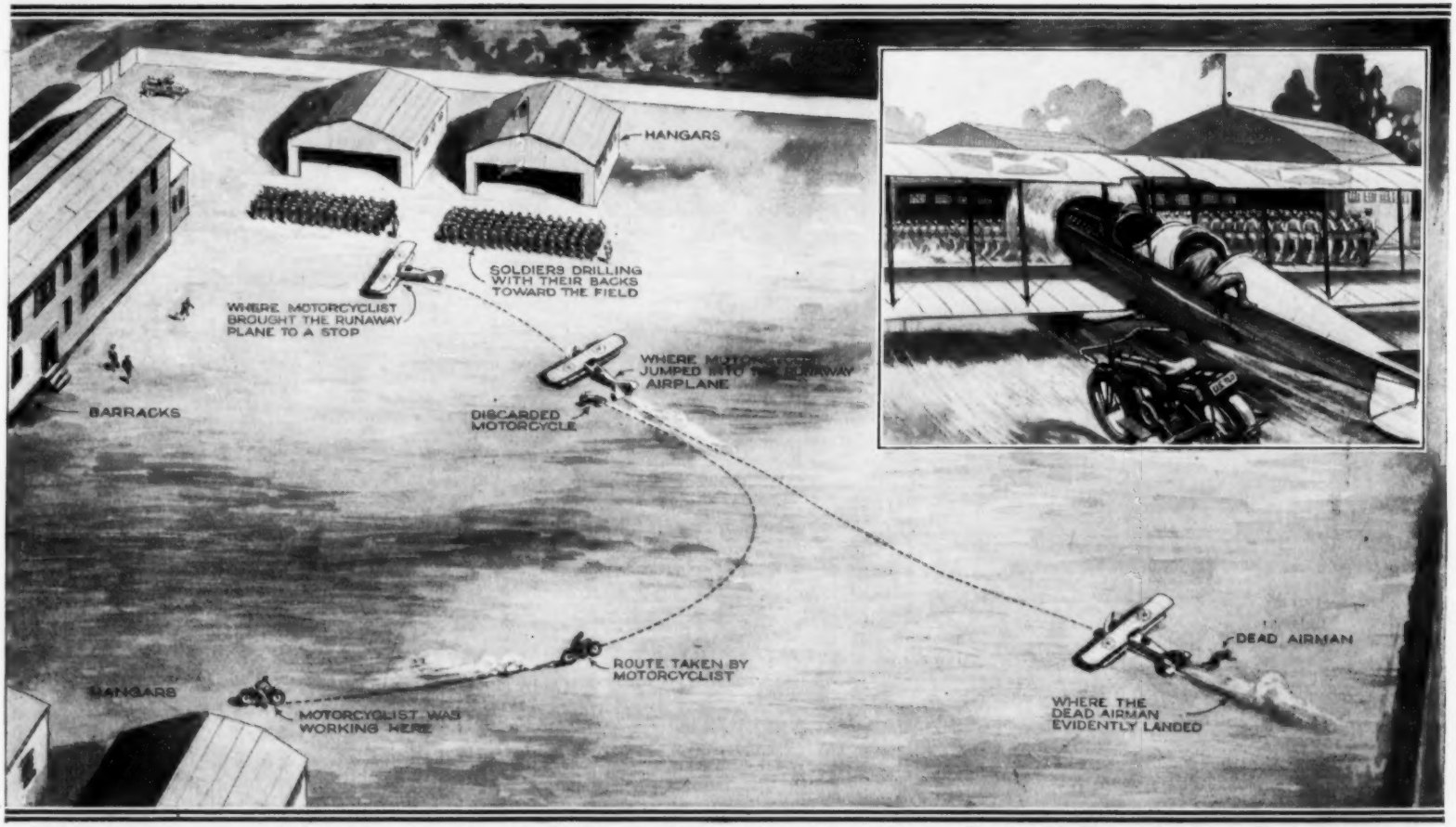
A florist and landscape artist has attracted considerable attention to his establishment by reproducing the design of an aeroplane in a flower bed on the slope adjoining his greenhouse. The figure is 18 ft. long and 6 ft. wide, and several hundred plants of various colors have



Novelties in Designs for Formal Flower Beds: The Representation of the Aeroplane Measures 18 Feet Long and 6 Feet Wide

entered into its composition. Surrounding it is a background of darker hue. Another bed represents a passenger train.

¶The United States Naval School of Turbine Engineering has been established at Carnegie Institute, Pittsburgh, and is now training men in anticipation of the needs of our merchant marine.



This View Indicates the Path of the Runaway Airplane, the Position of the Daring Dispatch Rider Who was Cleaning His Motorcycle near the Hangar in the Left Foreground, and the Company of Soldiers Drilling at the Opposite Side of the Field. The Dead Airman, Who was Found with His Head Crushed, as Indicated in the Right Foreground, Evidently had been Struck by the Propeller as He Started His Engine. The Insert in the Upper Right Corner Illustrates the Desperate Leap of the Motorcyclist into the Fuselage of the Runaway Plane, Whose Mile-a-Minute Speed He Checked Just in Time to Save the Soldiers

MOTORCYCLIST'S DARING LEAP SAVES MANY LIVES

A dispatch rider's daring leap from a motorcycle into the fuselage of a runaway airplane going 60 miles an hour averted, by a few feet, an appalling disaster at a Pacific-coast flying field. The motorcyclist was cleaning his machine near the hangars when the riderless plane flashed by. It was headed straight toward a company of soldiers drilling with their backs toward the onrushing destruction. Jumping into his saddle and throwing on the last ounce of energy, the dispatch rider succeeded in swinging in behind the plunging, bounding plane, and leaped for a hold. The desperate chance won. Drawing himself up and into the fuselage he brought the runaway plane to a stop not 50 ft. from the backs of the drilling men, through whose ranks it would have torn to its own destruction beyond. The missing pilot of the derelict plane was found on the field with his head crushed, evidently by a blow from the propeller as he started his engine.

HOW SAILORS LEARNED TO "SPOT" U-BOATS ON DRY LAND

By LLOYD SEAMAN

BRITISH seamen are never done marveling at the marksmanship of the American sailors who manned the guns of the merchant ships and the destroyers on the Atlantic Ocean in the submarine war. Their record is indeed remarkable, for Yankee jack tars, green to the sea and new to their guns, did, in their first months at the new game of spotting U-boats, show accuracy that broke all precedents.

That the back of the submarine offensive was broken so soon after America got into the war full swing, is due to the fact that the United States Navy, in its vast training stations on land, instructed its recruits fully and expertly, in this most difficult and the newest of all gunnery problems—the hitting of bobbing, fleeting, diving conning towers.

No precedents were there for this task. Submarine warfare was new. England had learned the science of catching the range of the will-of-the-wisp periscopes only by hard experience, by training its men in actual practice.

America could not do this. It had to train its men far inland, and at all events on terra firma.

But it mastered the science by inventing a "submarine game," a miniature range which could be put up on any level floor and used to give the new men adequate and realistic education in shooting periscopes, "shooting" with a pair of binoculars!

The game was played in this way: Upon a low platform the sailor lay prone, resting his glasses on a board upended before him. Ahead stretched the range, and at its other extreme, stood a large painted canvas colored in imitation of the sky. The sailor lying upon the platform and peering through glasses which he held, got approximately the same angular view that a sailor had on a 40-foot bridge at sea. The range in every particular is laid out an inch of imitation to a yard of reality. That is, the range being 2,300 in. long represents 2,300 yd. at sea—close to the greatest distance at which a submarine could be sighted. At the platform where the sailor studied the play range this same scale was carried out, the top of the board, upon which the sailor rested his glasses, being 13 to 14 in. from the floor level. This of course was relatively like the 13 to 14 yd. at which a ship's bridge rears above the water level. Midway between "bridge" and "sky" is a faint chalk mark which, unseen by the peering sailor, runs to the "sky." On either side of it run other lines, parallel each with the other and 2 in. apart. At every 50 inches another chalk line crosses them at right angles, making this half of the range scientifically crosshatched. These right-angle lines are charted at certain distances from the "bridge."

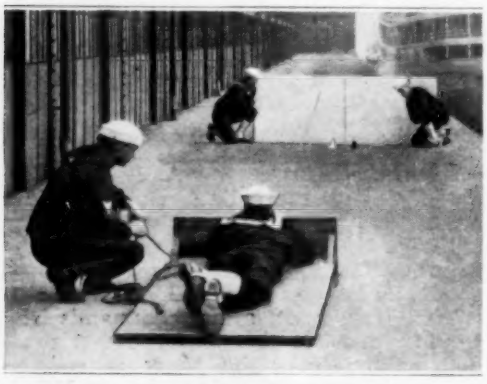
Beside the prone sailor kneels a master at arms, and somewhere down the range stands an instructor who aids this official.

The master at arms commands the pupil to focus his glasses on the "horizon." This is the black line made where the canvas frame rests on the floor. When this has been done the master at arms raises a wooden flap before the pupil's glasses, shutting off his view of the range and at the same time signaling to the instructor to set up the target at a certain range. The instructor places a small

The Range is Laid Out on the Scale of an Inch to the Yard. The Pupil, Using Binoculars, is Given Two Seconds in Which to Determine the Position of the Imitation Conning Tower, in Front of Which, in the Above Picture, is Shown the White Pyramid That Serves as the "Splash"

wooden replica of a submarine conning tower on some one of the parallel lines, noting how far to the right or left of the center line it is and, by the nearest cross line how many inches it is from the "bridge."

Then the master at arms drops the wooden flap, revealing for two seconds the range to the pupil before shutting off his sight again. In that time the student must determine how far away the conning tower is, its "range," in other words,



The Floor of the Range is Accurately Plotted with Chalk Lines, Making the Exact Position of the Target Apparent to the Instructors

and also how far to the right or left of the center line, or as they term it, the object's "deflection."

The student calls out as though to a gunner waiting, shell in breech, lanyard ready on the deck below: "Submarine sighted. Nineteen hundred and fifty. . . . Forty-eight."

Translated this means that he guesses the conning tower is 1,950 yd. away and two points to the left of the center line. This center line is represented on gun range finders as "50," points to the left descending in order, such as one point, "forty-nine"; two points, "forty-eight"; three points, "forty-seven," and so on, while points to the right ascend, "fifty-one," "fifty-two."

In actual battle a gunner receiving this order would turn his calibrated measuring mechanism so that the shell would hit the water at a point 1,950 yd. away and two points to the left.

In the "game" the instructor down the range places on this point of the floor, a small white pyramid, called the "splash," since it represents very satisfactorily the column of water thrown up by a shell.

The chances are the "splash" is short or "over" the conning tower, and the student is given another chance, and is trained until he learns to get both distance and deflection correctly.

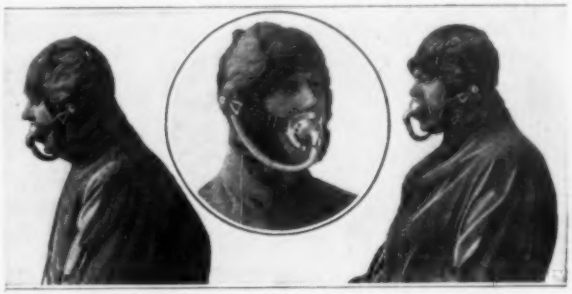
¶ It is now stated on good authority that during the war parrots were placed in the Eiffel Tower because they gave warning, by their actions, of the approach of enemy aeroplanes.

THREE-TERM SCHOOL YEAR DISPLACES TWO TERMS

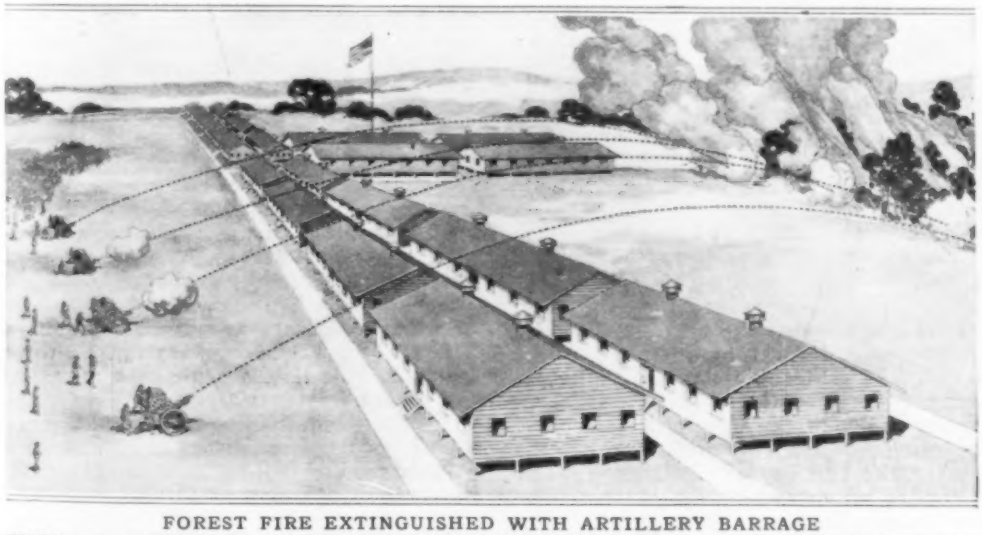
The school authorities of Minneapolis, following the example set by several higher institutions of learning, have adopted the three-term plan for grade and high schools to take the place of the two-term system commonly in vogue. An advantage of the new arrangement is that it permits promotions three times a year and more frequent reclassification of pupils. Each term now has 13 weeks and the vacation period is of the same length. Eventually the summer-school work may be merged into the regular courses so that, if a pupil desires, he or she can attend school the year round, doing four years' work in three. Such a plan, it is believed, would result in more pupils finishing their courses.

PHONE APPARATUS FOR AIRMEN IS OF MARKED SIMPLICITY

Now that the Hun is in restraint, attention may be called to a simple telephonic apparatus, developed for airmen, to enable pilot and observer, or passenger, to communicate freely with each other while aloft. The roar of an airplane motor, it will be recalled, is so great as to prohibit conversation by ordinary means. A sensitive receiver and a dictograph transmitter are incorporated in a helmet. Held firmly in place before the wearer's lips by elastic straps is the mouthpiece of a speaking tube. The latter conveys the voice sound vibration to the transmitting instrument, while cutting out and eliminating to a large degree the motor noises. The two helmets are connected by wires. Each of the helmets is provided with a flexible cord which plugs into a receptacle in the fuselage. The apparatus is very simple. It does away with the breastplate transmitter. Arrangements also have been made to attach to the mouthpiece the oxygen apparatus used for high-altitude flying.

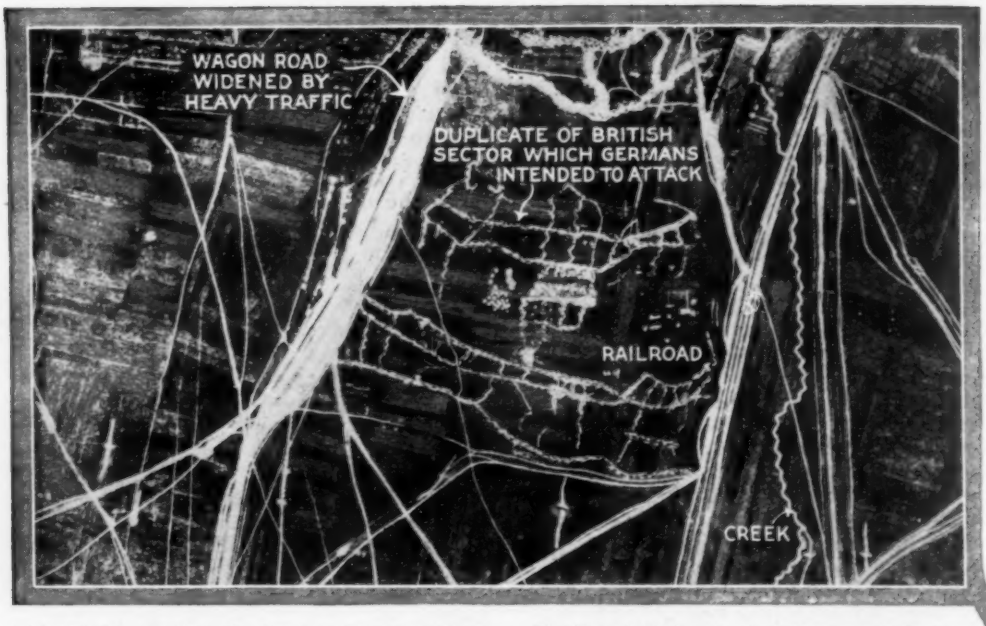


Aeroplane Observer and Pilot Equipped with Telephone Outfit Which Enables Them to Converse Despite the Noise of the Motor: Insert Shows Front View of the Transmitter



FOREST FIRE EXTINGUISHED WITH ARTILLERY BARRAGE

THIS western army camp was in serious danger of destruction by fire, which was charging down upon it from the blazing brush and forest beyond, when reinforcements arrived in the shape of a company of field artillery. The guns quickly laid down a barrage of shells that utterly annihilated the enemy. The soldiers of the camp had used all their fire-fighting equipment in vain when the happy thought occurred to bombard the conflagration. Within five minutes after the first gun was fired the flames were extinguished, smothered by the flying earth, and scattered in dying and harmless fragments.



This Photograph Won the Allies an Important Victory. The Trench System in the Middle was Built by the Germans for Rehearsing an Attack on a British Sector in Flanders, of Which It Was an Exact Duplicate. The Widened Wagon Road Indicated Large Troop Movements, and a Telegram to the Commander of the British Sector Gave Him Advance Information Which Resulted in a Bloody Repulse of the Attack

THE EYE BEHIND THE LINES

How Pictures were Used to Win Battles Demonstrated for the First Time

By DOUGLASS REID

Part I—The Spy of Spies in Long-Range Reconnaissance

BY the eternal fitness of things Sir Arthur Conan Doyle should write this story, for in the spellbound hours in which laconic brown men in khaki and "horizon blue" gave it to me, I visualized no one so much as Sherlock Holmes, grim, brooding and penetrating, riding in their places miles over the smoke of Flanders; sitting in their places in the map-littered dugouts behind the lines of battle, untangling the mysteries of uncanny secrets.

It is the story of the greatest detective system ever devised by man, the inner story of how the allies by aerial photography and weird deduction from meaningless prints of the German lines solved the riddles of the foe—the story of "the camera, the best spy of all time."

For, as much as any other factor, the camera won the war. Time and again the allies, in those terrible days of suspense before America flashed to the rescue, only met and stopped Hun drives because the camera had told them where and when to prepare. And in the brief year of America's fighting, the all-seeing eye of the black box from our planes did its share in ripping the veil of secrecy off German plots of battle. Into this story will come the strange case of the human footprint and the countless things of stealth it revealed, also the curious "rogues' gallery" of German generals which the allied detectives collected, kept, and used with such sure might—also the odd . . . but a beginning must be made.

In the first place one must understand that the general in warfare must always see the whole line, see his own men, see the enemy, see everything. Cæsar stood on hills and saw his handfuls fighting over a valley. Napoleon always ordered a high scaffolding erected to view his battles; Frederick the Great preferred windmills. Foch sat in a cellar, 30 feet underground, and saw a thousand times more than Napoleon on his turret; saw infinitely more of that line from the Alps clear to the sea than the Corsican saw of the scant 10 miles of his battle lines.

This was because Foch had the camera, while Napoleon had a spyglass. Modern photographic science laid before each allied general a complete picture of everything the enemy was doing and almost everything it was going to do. It showed him unmistakably what his own men were doing and what they could do. It relieved him of conflicting stories from spies, from human mistakes—for the camera does not lie.

Napoleon could but guess what Wellington was planning; Foch could send up a photographer and within an hour know what Ludendorff was thinking of.

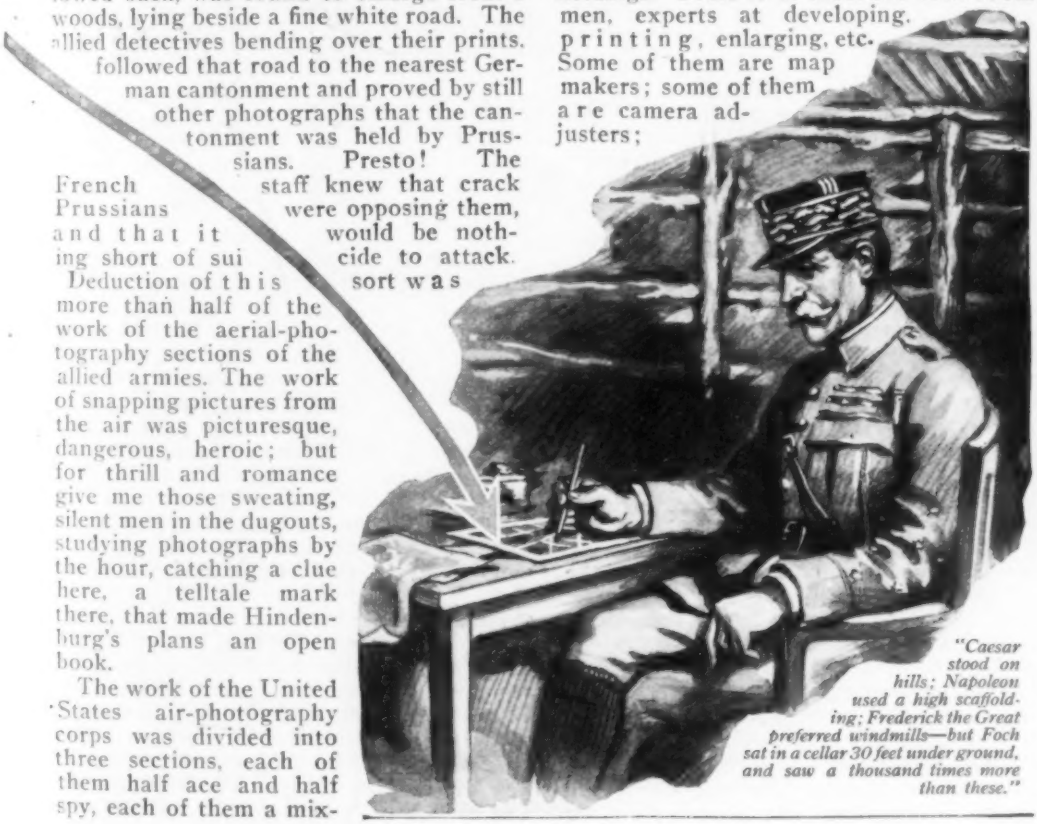
Consider this: Once the French were planning to take a certain hill, knowing that Bavarian "Landsturm"—poor machine-gun fighters—held it weakly. At dawn a photographer went up, came dashing back with a picture, and 15 minutes later the French general called off the attack and saved the lives of thousands of his men. And yet the camera had caught no remarkable thing. It merely showed that one group of men had gone out and another come into the trenches during the night. The footprints of the Germans told that much. The incoming trail, followed back, was found to emerge from a woods, lying beside a fine white road. The allied detectives bending over their prints followed that road to the nearest German cantonment and proved by still other photographs that the cantonment was held by Prussians. Presto! The French staff knew that crack Prussians were opposing them, and that it would be nothing short of suicide to attack. Deduction of this sort was more than half of the work of the aerial-photography sections of the allied armies. The work of snapping pictures from the air was picturesque, dangerous, heroic; but for thrill and romance give me those sweating, silent men in the dugouts, studying photographs by the hour, catching a clue here, a telltale mark there, that made Hindenburg's plans an open book.

The work of the United States air-photography corps was divided into three sections, each of them half ace and half spy, each of them a mixture of reckless daredevils and cold master minds.

The first was long-range reconnaissance, performed by the United States Division of Aerial Photography; the second, trench photography, and the third, battery photography, both performed by the United States Army Section of Photography. The men who did the work in the second and third branches were merely attached to a certain sector to be of immediate help in solving the doughboys' perplexities. Fighting men might be moved in or relieved, but the photo section remained always at the same sector, thus becoming perfectly familiar with every hill and dale.

Sherlock Holmes would have been in long-range reconnaissance! For here the powers of human deduction were put to their greatest test. Everything that the enemy was doing, miles and miles behind his lines; all that he was getting ready to do, must be photographed and translated.

A photo section in the American army—and the French and British organizations, in the main, paralleled our formations—consisted of 30 men under a first lieutenant and was assigned to do sleuthing over a certain territory far within the Hun holdings. Some 15 of them are dark-room men, experts at developing, printing, enlarging, etc. Some of them are map makers; some of them are camera adjusters;



"Caesar stood on hills; Napoleon used a high scaffolding; Frederick the Great preferred windmills—but Foch sat in a cellar 30 feet under ground, and saw a thousand times more than these."

some are lantern-slide authorities, and some are file clerks. Two of them are motorcycle riders, who hurry the prints to the staff officers. The first lieutenant, his first sergeant, and such other men as qualify, are photographers, riding with the airmen who are assigned to take them where they want to go.

The camera here is the spy behind the lines, a furtive thing hanging stealthily on the clouds, miles high; slipping here and there over the enemy unseen, yet seeing all. Contrary to the general belief, it is now known that the long-range reconnaissance men were usually unprotected on their trips.

The photographer is driven aloft in a slow plane, one that an enemy combat plane can easily overtake, since the latter holds but one man and no camera. Anyway, he goes up. He may be assigned to take map pictures, or he may be told to take special views of a certain suspicious spot. He works with a map camera in the first instance, a standard aerial camera in the latter, or in exceptional cases he may use a special "gun" with long focus to bring out a strip of ground with extra clearness. He rarely or never takes pictures below three and one-half miles. His task is not hard, according to himself. He is told his objective when he ascends; his camera is set to be "shot" at a certain altitude, at a certain plane speed, and his shutter is corrected to meet the atmospheric conditions. Science makes his task largely a formula to be followed—all he does is risk his life.

A German Cantonment behind the Lines in the Verdun Sector: The Numerous Trails near the Intersection of the Roads Led the Allies to Suspect the Presence of a Big-Gun Battery in a Wooded Hill Near By, and Later It was Definitely Located and Destroyed. Here Also were Found Practice Trenches Indicating a Contemplated Attack on a French Position 10 Miles Away

Every foot of German ground assigned to him he photographs, not once but a thousand times, covering it painstakingly, then doing it all again. His pictures the photographic officer studies with a microscope, hunting clues. He sees where the enemy headquarters are, where their big guns are, where they are building railroads, gun emplacements, where their signal stations are, and in more cases than one can believe, what they are thinking!

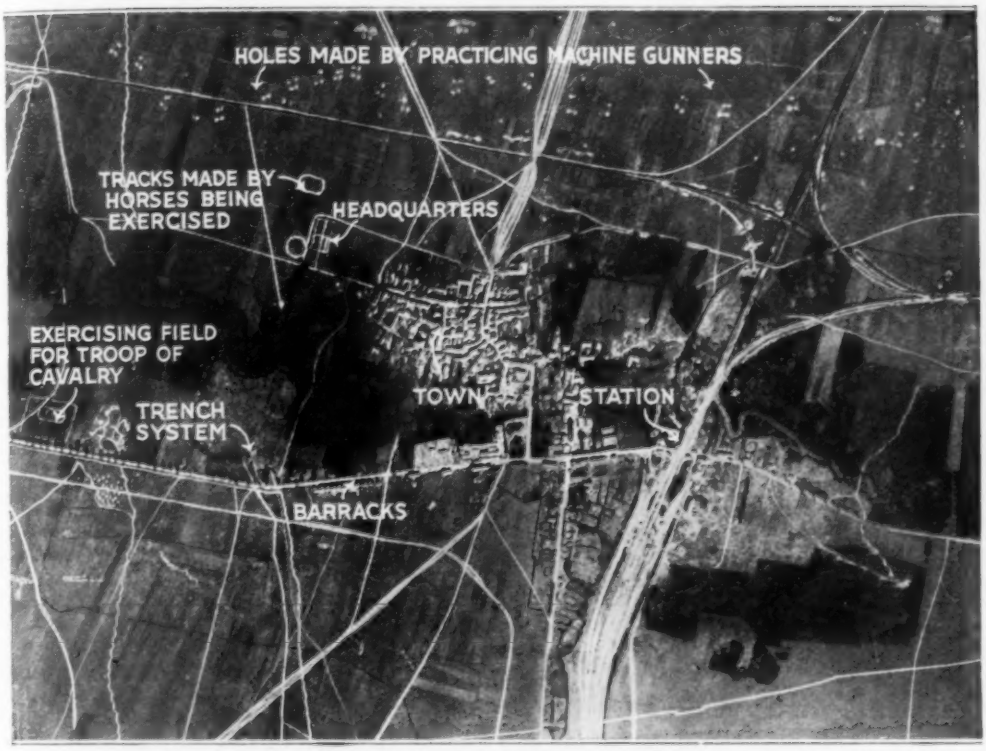
He picks out objects for his own bombers and for his own big guns. He sees where all the Hun generals are, and where they will strike next. He is the detective who gets to know all of his criminals' habits.

He can take a flat, uninteresting picture of a landscape, discover a German cantonment, a general's headquarters, and before he is done with it, tell that general's name, how many men he has under him, where they will attack next, how soon, and just what sort of an attack the allies may expect.

Footprints tell him most of this, for there is no more astonishing thing in the whole marvel of aerial photography than the camera's ability to catch the trail of a walking man. At two and a half miles in the air the ordinary aerial camera will show the footprints of a man going across slightly shelled ground. At a mile it will show them on new-mown grass. At five miles it will reveal them trailing across "No Man's Land."

The following may be taken as a normal instance:

In a picture of a village, 15 miles behind the lines, the photographic officer notes buildings that instantly betray themselves as barracks. Definite trails, that only soldiers living in them could make, lead to them. Near by is a villa, farther on a town. He sees that the place is a railroad center and a division point. The villa he scans closely. Hard by it is a faint irregular circle on the grass. This was made, he reasons, by horses being led about by orderlies so that they may cool off gradually while their riders are inside. The riders have come for information. The villa is a headquarters. Aside from



One of the Most Important Photographs Taken in the Whole War: The Various Markings Mean Little or Nothing to the Untrained Eye, but the Staff Officers, by a Truly Marvelous Process of Deduction Established the Fact That Here Was the Headquarters of a German Major General, in Command of 10,000 Men, with a Certain Number of Machine Guns and a Troop of Lancers, with Which He was Preparing an Attack on a French Position, 30 Miles Away, to Take Place in About Three Weeks

machine-gun officers, majors are the lowest officers of foot soldiers that are mounted. Hence the man to whom majors come for orders must be a colonel or better.

Now, behind the villa, the detective spies a larger and more regular circle on the grass. This, he deducts, is made by orderlies exercising horses daily according to routine. The officer of the villa has a private stable of horses for himself and staff. Now he knows an all-important fact: the German is either a brigadier or major general.

Next he discovers practice trenches and machine-gun pits on the outskirts of the town: an infantry organization. Then he finds still another circle made by horses, a circle just large enough for one troop of cavalry to use in practicing.

This tells him that the officer in the villa is a major general, since no brigadier general in the Hun army boasts a troop of cavalry.

He scans this last circle more closely. Its shape informs him that the troop is composed of lancers rather than saber men, since it is round, whereas the circles of saber men riding in practice are in the shape of a figure "8." Lancers drill, thrusting from the right-hand side only, while saber men practice striking to both right and left, their horses being trained to step so that weight of both man and beast will be thrown into the blow, thus weaving in and out in a figure eight.

Discovering this, the detective turns over in his mind the names and organizations of the various German major generals. Only one has a troop of lancers attached: Major General von A.

This, then, is he.

What is he planning?

The photographic officer bends over the system of trenches which the Hun infantrymen have created for practice. This is a replica of some little sector of the allied lines which the Huns are going to attack. They have photographed it, worked it out carefully, and duplicated it exactly, in order that their men in the hour of attack may be perfectly familiar with their objective.

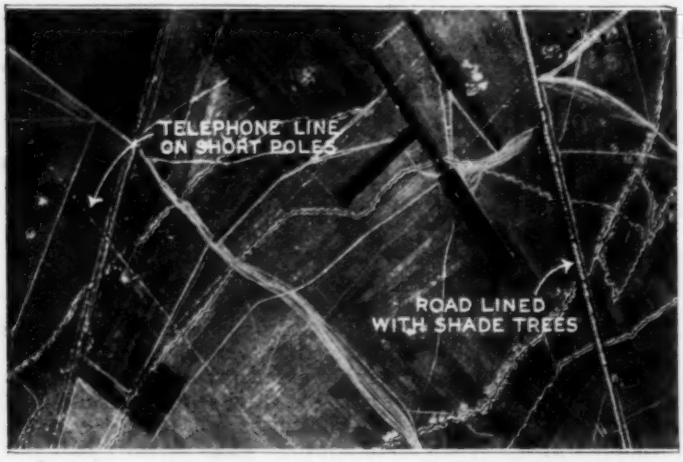
Our detective calls for a map of the

allied lines within a radius of 50 miles. Experience has told him that the Germans will not be planning to attack farther away than that. He goes over this map carefully, and finally finds a plan of trenches in such and such a sector of the French lines, 30 miles south, let us say, that he is safe in concluding is the particular sector the Huns are going to attack.

The Narrow-Gauge Railroad Winding among the Hills was Recently Laid, as Revealed by Its Whiteness. By Following It to Its Junction with a Standard Road, an Ammunition Depot was Located and a Point Identified Where a New Offensive could be Expected. The Plate was Cracked When Dropped from the Observer's Plane in a Parachute

Again he bends over the picture. The Huns have not completed their work. He knows that they will practice two weeks after their completion and then occupy a day and a night transferring to the place of battle. So with a final scrutiny of the number of machine-gun practice pits he writes out a report to the army commanding officer informing him that Major General von A. with so many thousand infantrymen will attack such and such a sector on such and such a day, employing a certain number of machine gunners, and that in the meantime bombers can find Major General von A. at this certain spot. This report is positive—the aerial detective can be relied upon.

The following day the photographic officer sends another camera man to hover over Major General von A. and make another picture, and each day thereafter the same thing, so that when at last the German officer leads his men to the objective, not only is he met and defeated, but his entire record is hanging on the wall where it may be used as a key to his way of preparing, his habits, and his weaknesses, against the next time he sallies forth.



The Allies First Mistook the Tree-Lined Roadway for Marching or Standing German Troops, and, after Shelling Them All Day Long, Marveled at Their Discipline, Until the True Nature of the Mark on the Plate was Reasoned Out. The Telephone Line, However, Furnished No Puzzle, for the Circles around the Posts Indicated the Path of the Watchman Patrolling It

Allied photographers collected during the war an enormous amount of information on Hun division commanders, cataloguing their methods of fighting, and filing away absolute proof of how they chose to fight, just what their pet theories were, and how they sent their men into the fray.

A veritable rogue's gallery.

Another instance: General von B. is located near Château-Thierry, let us say. The photographers know from other days that he commands Bavarians. They produce

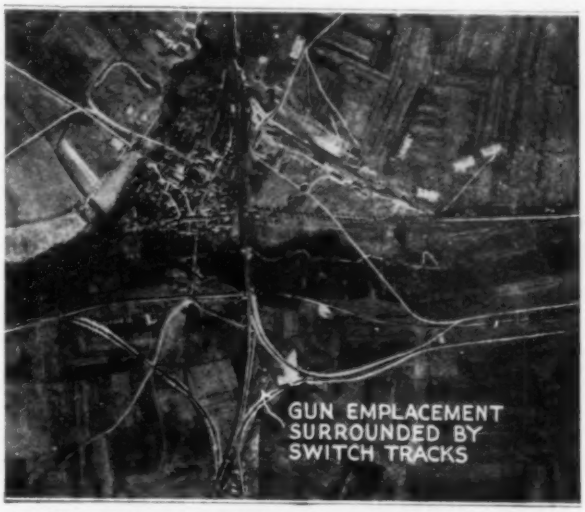
pictures which prove Bavarians are preparing to attack at Château-Thierry. How do they know this? Their practice trenches are duplicates of the French lines at this point.

But how do the pictures tell the Germans are Bavarians?

Absurdly easy, if you have a deductive mind.

In the cantonment are seen a large number of winding paths. Here goes a skein of them made by soldiers cutting across lots to the back door of their barracks at night. Here go a dozen more shooting across to the canteen. All over the field are evidences of men making their way the shortest way, disobeying orders, since German commanders insist that their men keep to the beaten paths for the very reason that the allied photographers learn much by following vagrant trails.

Now these signs of carelessness are sure proof that the men are not Prussians, for the Prussian guardsmen obey orders, are better soldiers. The men are from south Germany, where the people are pleasure-loving, and they have been loafing about the canteens with the garrulous sociability of their race, slipping back late at night to their barracks by the forbidden but quickest, shortest way. They probably evaded their own good-humored sentinels, leaving trails unnoticed from the ground, but betraying everything to the allies, on whose photographs their footprints showed like rabbit tracks in the snow.

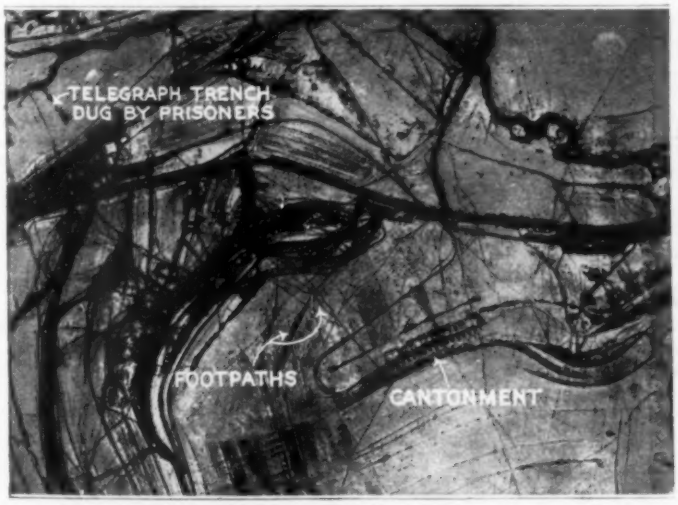


In This Picture the Photographer Caught a Newly Laid Emplacement for a Large Gun. The Germans Built U or Y-Shaped Switches around the Big Pieces in Order to Enable Them to be Fired in Any Direction, if Placed on a Railroad Car, or to Bring Up the Heavy Shells on Crane Trucks to a Stationary Gun. The Camera Told, Also, the Kind of the Latter, for the Emplacements of Naval and Land Guns Were of Different Shapes

Allied photographers laid the whole German railway and telegraph system open to bombers and discovered clues whereby military plans were anticipated months ahead.

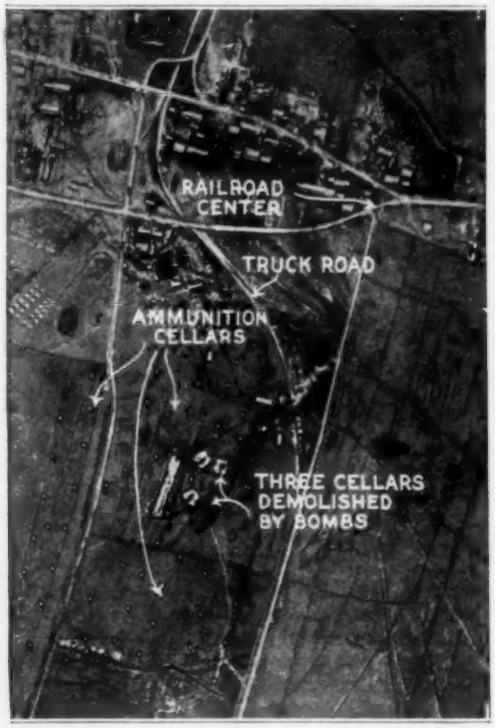
For the first months of the war—and here it may be said that military men at the beginning of the conflict scouted the whole efficiency of aerial photography, and the first pictures were made with ordinary cameras — the photographers were puzzled by queer curving lines in their prints, lazy, looping lines that bent seemingly without rhyme or reason. Finally they saw that they always formed a juncture with a standard railway sooner or later. They might be smaller railways they reasoned, but why the unnecessary curves?

Then, by deduction,



A German Cantonment Photographed in Winter: Because of the Presence of Snow, the Camera Shows Up the Various Footpaths and Trails with Astounding Clearness, but the Maze of Tracks Also Tells Something More Important, Namely, That the Barracks Housed Easy-Going Bavarian, or Other South-German, Troops, for the Strictly Disciplined Prussians would Not Dare to Use Any But Prescribed Roads. Note, Also, the Prisoner-Dug Telegraph Trench in the Upper Left Corner

they perceived that the bends were caused by hills that were made invisible when looked at from above. The Huns could not take time to make grades and cuts for these temporary roads, and therefore followed the terrain, whereas their main lines were put through on the level, cutting and filling as required. Later on in the war, the Germans sought to confuse the allied cameras by making these narrow-gauge roads appear as wide as trunk lines, digging up the dirt on either side to give the line the broad aspect of the important road, but it was wasted efficiency, for the photographers could note the abrupt turns that would derail a standard coach, and when the road crossed an exposed table-land, where it would be unsafe to send the puffing "dinky" engine, the white trails of the draft mules showed plainly between the rails.



A Big German Ammunition Depot, Consisting of a Large Number of Concrete Cellars, Spaced Widely Apart to Prevent Complete Destruction of the Depot if One is Blown Up: The Photograph was Taken After Three of Them had been Destroyed in a Raid

The distinction between these roads was important because wherever a narrow gauge joined a standard gauge, there, nine times out of ten, was an ammunition depot, where allied bombers at night could work havoc. A new narrow-gauge road meant the moving of men and ammunition at no distant date, to some point of activity. Whenever the allies found these they let the Germans finish their construction work, watching the progress steadily; and in time, noting where the road had its terminus in the Hun trenches, warned their own infantry to expect an attack at this point.

Photographs disclosed the location of every big railroad gun the Germans used. A Y or a U-split in the tracks revealed each of them. A "Y" meant a big gun, for it gave the cannon, mounted on a railway car, the opportunity to move about and point at any possible sector. A "U" meant a big gun, because behind many of the giant cannon, switches in the shape of this letter had to be laid for the carrying of the heavy shells up to the gun's breech on a massive crane. When the Germans made emplacements for their great stationary guns, the camera caught that too and told whether the cannon was a naval or a land piece, for the former had round and the latter crescent-shaped emplacements.

The task of spotting telegraph wires was more difficult, for the Huns, soon learning that the allies had located their ordinary overhead-wire system like that used along American railways, took to burying all their wires, since the enemy bombers took special delight in messing up their poles and wires at frequent and distressing intervals. They produced digging machines which cut a narrow trench through the earth, and they made time by setting batches of prisoners to work with shovel and spade. But the camera not only caught both, but distinguished between them; a valuable thing, since the prisoner-laid wires were not nearly so deep—the prisoners of course being lazy—and could be reached better by bombs.

The distinction was made by this fact: The prisoners threw dirt out of the trench first on one side and then on another, one squad throwing one way, another squad the other, while the machine cast out all the dirt on both sides of the ditch. This showed plainly on the prints.

After the bombers had foiled the German cleverness here, the Huns bethought them of a new scheme. They would go back to aerial wires, but use smaller iron posts that would not make the telltale dots, and they would string fewer wires in order that nothing might be visible. They worked this out, smoothing all dirt away from the post holes, but the allies a day or so later roared with laughter. The

system was as plain as ever. For this reason: The German signal corps kept a man always patrolling the wires, watching them, mending them constantly. And his footprints betrayed everything, for they were not in the ordinary straight line made by a man walking a beat. At every post they turned out, went around, and then turned back into the path again. Wherever there was a post, therefore, was a big circle.

A more difficult feat was the detection of marching men on the clear white roads of France. In the early stages of the war it was common for a print to disclose dark ranks of marching or standing men all along the causeways. Immediately the photographers informed their batteries, and the big guns began shelling the troops violently. A plane would go up, shoot a picture of the effects, and return. Gaps would be torn in the ranks, but the men would be still in formation. "Marvelous discipline," the allied commanders would say staring at the picture; "what splendid obedience; poor fellows!" and would go back to pounding them some more.

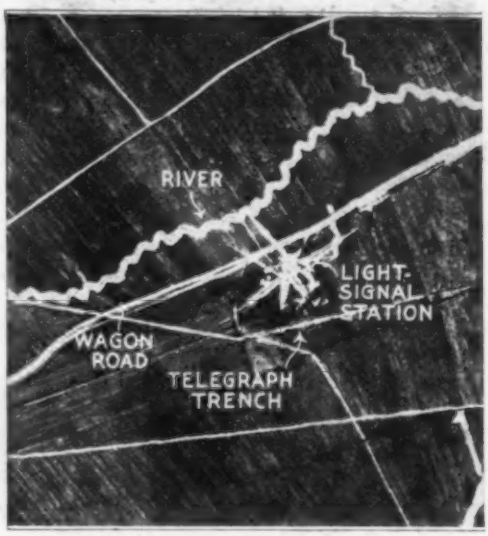
Photographs coming in would show little or no progress in routing these bands. Sometimes the black lines could be seen re-formed over the actual shell holes.

Then the detectives took time to think, and discovered that the black ranks were not men at all but the shadows of the poplar trees that flank the roads in Picardy and Flanders!

Later on they could tell at a glance where the road was full of shade or men, because the shade would run unbroken across the road from the side from which the sunlight came, while no ranks of men would quite stretch entirely across the road on both sides.

Daily photographs of the roads far behind the enemy lines told much of his intent, for the moment a big movement of troops or trucks got under way it was impossible to keep traffic on the path, and men and cars, turning out and in, made parallel paths, widened and whitened the way to such an extent that, on the picture, it immediately became a glaring ribbon or hank of thread, unmistakably transparent.

In revealing light-signal stations, too, the camera accomplished wonders, for it was by these carefully buried centers of information that the Germans thought to convey secret information to distant points when telegraph systems were crippled and dispatch bearers too slow. Digging deep into a hill they buried a powerful acetylene light, and in lines radiating from it, dug trenches down which the light could flash and flare directly at some far-distant station and be seen by no one unless he happened into the narrow path where it played. But these showed up glaringly on the prints and offered easy targets for bombers.



Acetylene Lights for Signaling Purposes were Placed Deep in a Hill. The Germans Thought This Scheme would Prevent Discovery, but the Camera Betrayed the Stations. That the Telegraph Trench was Dug by Prisoners is Proved by Its Irregular Edges, the Prisoners Throwing the Dirt Alternately to One and the Other Side

It was in map making, however, that the purely scientific end of aerial photography had its innings. A special camera for this department of the work was invented, an automatic film affair—all others used plates—that could be operated by a pilot flying alone.

Both French and British claim to have developed this camera, and the truth, as nearly as one can discover, is that both, working under the same necessity, brought it to light at about the same time. The American forces used the French "Automatique, F.24," to best effect. The thousands of aerial photographers who trained in the United States, and who never "got over," swear by it, having "shot up" miles of innocent Yankee farm land with it.

It was invented because the allies found it impossible to take enough pictures on long-range reconnaissance in the time given them by "Old Sol." Hundreds of square miles had to be studied, and the fastest men could only take a fraction of the territory assigned to them. For the first two years of the war, they were forced to work with the "changer" gun, the best they had at the time. This held from 18 to 24 plates, which could be changed by

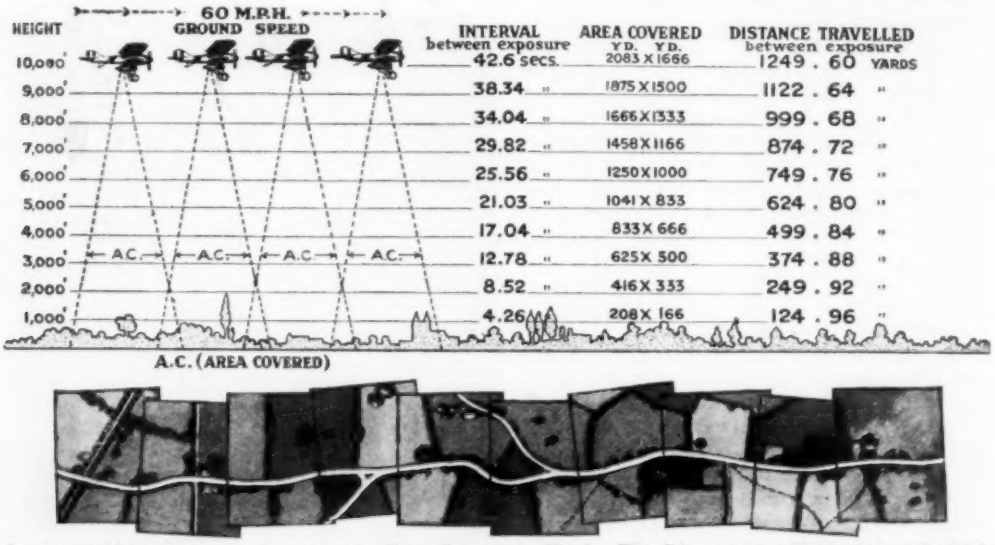
the mere touching of a plunger. Then came another camera, now simply known as the L-type. It was automatic, the transfer of plates inside the camera being accomplished by a plunger, as in its predecessor, except that no human hand was needed to touch it every time the transfer was to be made. A worm screw holding it in the camera projected out to the front of the box, where it was attached to a tiny propeller, which, whirling in the wind of the airplane's speed, operated the screw and consequently the plunger.

The map camera was evolved because plates were not completely satisfactory for the work, often not getting all of the ground beneath. This camera holds a film long enough for 120 exposures, and the photographer carries quantities of extra magazines so that he returns to headquarters with hundreds and hundreds of views of the enemy's fields. Within this camera are cogs which carry the film past the shutter steadily and surely. They also open the shutter at regular intervals, close it, wait until the stated time is reached, then open it again, taking a never-ending series of pictures of the ground beneath, each photograph overlapping its predecessor slightly.

All the driver of the machine does is fly until he reaches the altitude and destination for which his camera has been set by his officer, reach out his hand and touch a button among his controls, which sets the camera working, and then fly on a level over the territory which is to be mapped at that time.

He is responsible for the map of the particular 16 square miles which is assigned to his "photo section." He covers the ground, part of it one day, part another, as the weather and Huns permit, but it takes a dark, dark day and a fierce, fierce cannonade to keep him down. The moment he has taken every foot of his territory, he starts again and does it once more. His work is standardized. He knows just how many square yards he is photographing at a certain height. For instance, at 10,000 ft. he is getting a square mile on each picture at a speed of a mile a minute. If he is nearer the ground, or traveling faster or slower, the amount of surface in each picture will vary, for the camera is paying no heed, grinding off the pictures at the scheduled rate.

When he returns, his films are developed, prints taken, joined together by means of the overlapping system, and thus a complete and enormous picture of his section is made.

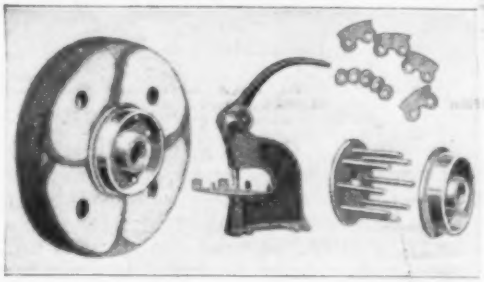


In Aerial Map Making, an Automatic Film Camera is Used. The Diagram and Table Above Indicate the Areas Covered by Each Exposure When the Flier Operates at a Given Speed at Various Altitudes. This Chart Shows the Intervals of Exposure for One-Inch Overlaps on a Five by Four Plate with an 8-Inch Lens. It Is Thumb-Tacked on a Board across the Knees of an Aerial Photographer Just above a Map of the Section over Which He Is to Fly. The Map Winds from Roller to Roller. If He is Flying 60 Miles an Hour, at 1,000 Feet Altitude, the Chart Indicates That the Plunger of the Camera should be Set for Every Four and One-Fourth Seconds to Secure a Continuous Overlap Photograph, Such as Is Shown Here

(In the April number, the wonder of the camera's spy accomplishments on German batteries, and the tricks of the stereoscopic method of aerial photography will be described.)

MAKES NEW BUFFING WHEEL FROM SAVED STUBS

Buffs used in metal polishing are frequently discarded when worn down to a diameter less than six inches. With the aid of a special steel hub now on the market, this waste can be redeemed, using several buff stubs to build up a new buffing wheel. The steel hub, in two parts, carries eight pins parallel with the shaft. Worn buff sections punched with two holes are thrust upon these pins, two pins to a section, four sections to make a complete circle, like the leaves of a four-leaf clover. Another layer of sections is then laid on in the alternate position, covering the spaces between the "leaves" of the first. Six layers in alternate positions, or 24 worn buff sections, make a 14-in. buff wheel of good face. It is balanced, if necessary, with lead, and the whole is clamped with the end of the hub, whose perforations fit the pins. When this composite wheel is worn down to the discarding point, the resulting waste is inconsiderable.

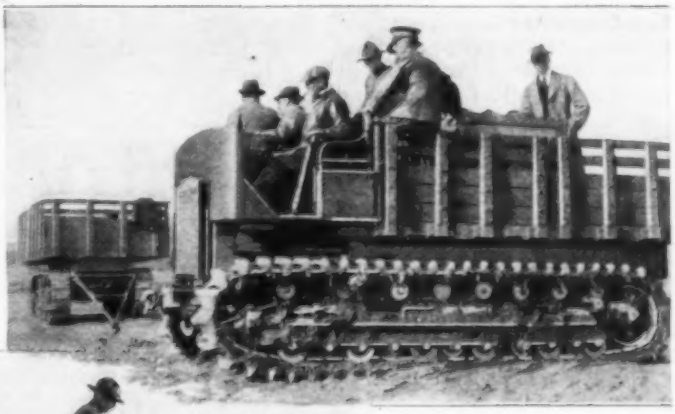


A Number of Worn Buff Stubs, Assembled on This Steel Hub, Make a New Buffing Wheel

¶ The casualties of New Zealand, according to report, totaled 57,932, of whom 16,500 were killed and only 45 taken prisoners.

BIG TRACTOR PULLS TRAILER OVER MARSH AND MUD

Ability of the heavy track-laying type of tractor to cross soft ground "with a light foot" is illustrated by the performance of such a machine weighing with its load over 11 tons, which pulls a loaded trailer across marsh and mud too soft to support men or horses. The reason for this is that the man of average weight puts a pressure of at least nine pounds to the square inch on the soles of his shoes. The unit pressure of a horse upon his supporting surface is much greater. The tractor, heavy as it is, bears upon the large surface of its creeper treads with a pressure of only 3½ lb. per square inch. The American-designed track-laying tractor is able to negotiate with full load a 100-per-cent grade on firm ground, and a 50-per-cent grade of the worst mud and slime. Tractor and trailer



The Trailer in the Background Has an Endless Tread Like Its Tractor, and Together They can Make Good Speed over Very Soft Ground

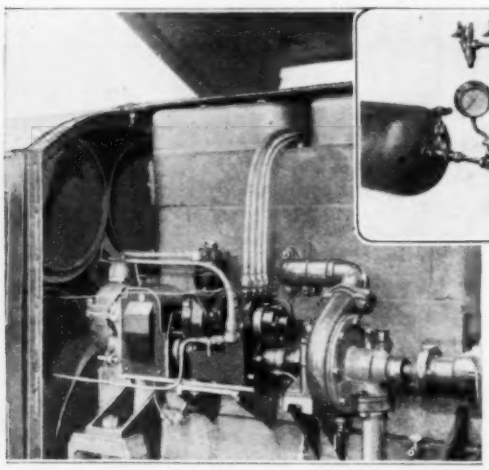
This Tractor, Weighing 11 Tons with Its Load, Is About to Descend a 100 Per-Cent Declivity and Then Ascend It

together carry a load of ten tons. For military use such a unit can keep up with troops advancing over terrain of any character.

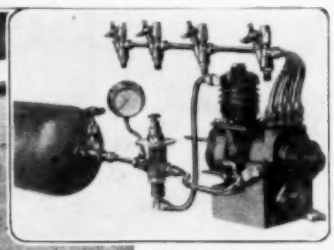
HEAVY-DUTY MOTOR STARTER IS QUICK-ACTING DEVICE

Intended especially for heavy-duty work such as aeroplane, truck, and tractor motors offer, a starting apparatus that utilizes the carburetion principle seems worthy of attention even though it is not a strictly new development. "Instantaneous" starting is the outstanding advantage of the equipment, which, it is claimed, will cause a motor to fire in one or two seconds even under extremely severe conditions. This is accomplished by filling the cylinders in firing order with a compressed-gas mixture, the explosion of which gives life to the engine.

The installation consists in part of a special carburetor that operates only when the motor is being started. Air from a compression chamber, in passing through it, is converted into a volatile mixture and delivered by a timed distributor to the cylinders on their respective power strokes. Compressed as it is, it first actuates the pistons and then, upon ignition, starts the engine. The procedure continues until the motor begins its regular cycle of operation. With air compressed to 250 lb. in the tank, an engine may be started about 15 times without recharging. A motor-driven pump refills the chamber in three minutes when set in motion by touching a button. Air may be taken from it for inflating tires. The outfit, said to be in use on hundreds of military aeroplanes, weighs only 30 lb. That for tractors and trucks weighs about 50 lb. In both instances the equipment is of compact form. To start a motor, the driver has only to press a button.



A Glimpse beneath the Hood of a Motor Truck, Showing the Relative Compactness of the Installation: The Compression Cylinder is Not Visible in the Picture Presented Herewith



The Complete Equipment, Including Tank, Carburetor, and Distributor, is Shown Above

AUTO SPRINGS ADJUSTABLE TO WEIGHT OF LOAD

Car springs adjustable to the weight of the load are the feature of a French invention which aims to secure equal comfort for one or the maximum number of automobile riders. At each end of the rear springs is an elongated slot, in which the eyebolts can be moved by a lever or wheel at the driver's seat. The effect of altering the position of the bolts is to lengthen or shorten the springs, thus decreasing or increasing their stiffness and resistance. Definite positions or stopping points are provided for the sliding bolts, so that the driver may adjust his springs to a specific number of passengers.

BUILDING FOR BACHELORS HAS UNUSUAL FEATURES

An unusual type of rooming house for men only, somewhat resembling a hotel or a club and yet different from both, has recently been opened in New York. The demand for these novel bachelor accommodations was so great that every room was rented before the building was finished. Many features similar to a Y. M. C. A. building are provided, including a gymnasium and general lounge room. There are also three soundproof rooms where musicians can practice on pianos or other instruments. The rooms are without ornamentation, and much cost was saved in the construction by omitting window trim and baseboards. It is proposed to lay out a covered garden on the roof.

¶All the properties used by the late Richard Mansfield in his repertoire of historical characters have been donated by his widow to the National Museum at Washington, and are now on exhibition.

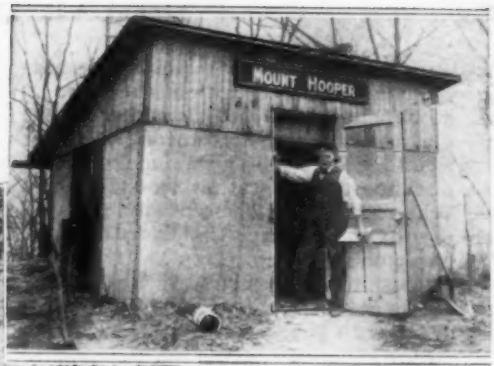
WIRELESS "AERIALS" UNDER GROUND AND UNDER WATER

By R. H. LANGLEY

AERIALS buried in the ground and trailing in the water! This is the latest thing to be announced by the Navy Department as one of its war-time radio secrets. The one part of every wireless station which everyone knew about and believed to be essential was the system of wires strung high in the air. Now we are told that these wires may be buried in the ground, or trailed in the water behind a submarine, and that they will still catch the signals from distant transmitting stations. We are even told that in many cases these underground wires are more effective than the overhead aerial system would be.

It is to Dr. James Harris Rogers that the nation is indebted for this important discovery. Doctor Rogers is a member of the Washington section of the Institute of Radio Engineers. He had his own amateur wireless station long before the United States entered the war, and is among those who have carefully followed each new development in the art. Today he takes his place as one who has himself made a valuable contribution.

An insulated wire is



A Field Station from Which Many of the Early Experiments with Underground Wireless Antennæ were Made

Laying an Underground Wireless "Aerial": The Use of Such Wires, It is Now Revealed, Was a Most Carefully Guarded War Secret

PHOTOS COPYRIGHT, INTERNATIONAL FILM SERVICE

A Wireless Station, with Its "Aerials" under Water, Established on the Banks of the Potomac River, Where the First Tests were Made to Prove the Utility of the New Invention: In the Foreground Is Doctor Rogers Communicating with Submarines below the Surface of the River. This Picture was Taken in the Winter

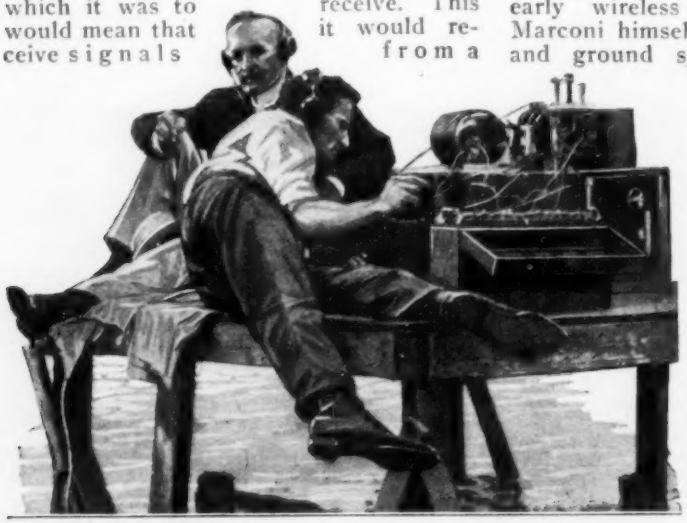
laid in a trench a few feet below the surface. The depth to which the wire is buried depends upon the character of the ground, and whether it is normally wet or dry. The length of the wire depends upon the distance to the station whose signals are to be received, and also upon the sensitiveness of the receiver that is to be used. The instruments themselves are the same as those used with regular aerials, and they may be located below the surface or above ground. Then the "earth" terminal of the receiver is grounded in the usual way, and the signals come in as well, and in many cases better, than they would from the usual antenna high in the air. In the same way, an insulated wire is run out through an insulator in the tail of a submarine, and is allowed to trail out behind when the boat is submerged. Here again the waves from some distant station, which have always been supposed not to be able to penetrate below the surface, are picked up by the wire and sent back to the receiver inside the submarine.

Doctor Rogers realized the military importance of his discoveries, and at once put them before the Navy Department. Representatives of the navy were invited to witness demonstrations at Hyattsville, Md., and were quickly convinced of the great usefulness and practicability of the system. They realized that the buried wire was much cheaper to install than the overhead system. They also knew that it would be highly directional if laid in the general direction of the station from which it was to receive. This would mean that it would receive signals from a great distance in this direction, without being disturbed by signals, even of the same wave length, coming in other directions. The tests also showed that these buried wires did not pick up nearly so much of the static disturbances which have always been the greatest limitation on the distance from which signals could be received.

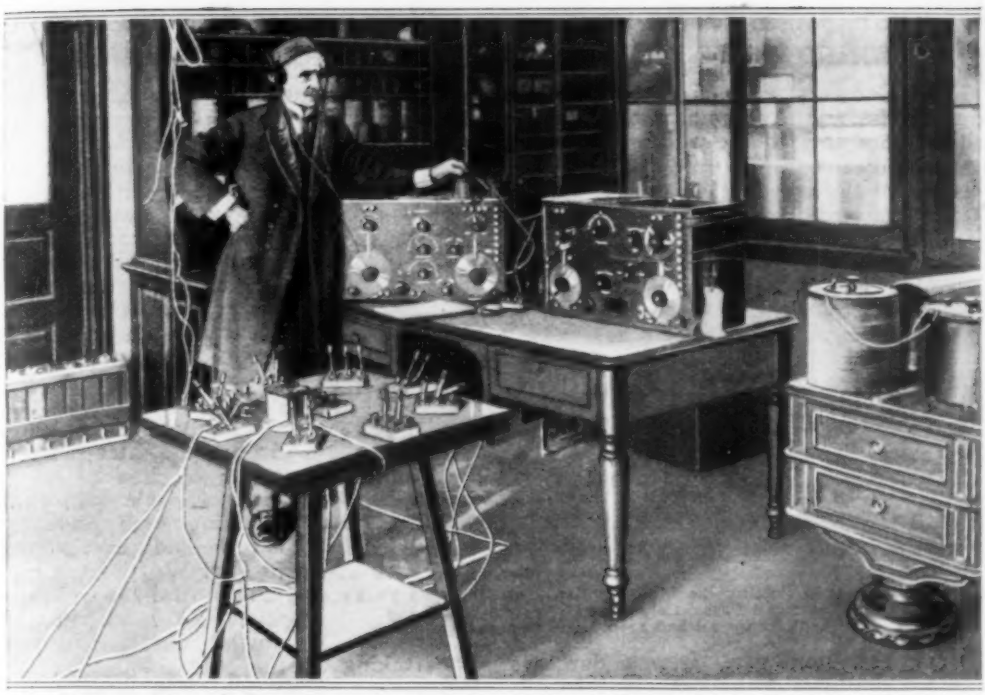
It seems that Doctor Rogers was the first one to attempt any practical application of facts which were pointed out by some of the earliest wireless investigators. In 1898, A. Blondel, of the French Society for the Advancement of Science, proposed the theory that the waves of radio telegraphy were "surface" waves; that is to say, waves that traveled, to a large extent at least, in the surface of the earth. In 1902, other scientists found that the waves could be considered as consisting of two parts, a "space" wave and a "surface" wave. The space wave spread out equally in all directions, up as well as horizontally, while the surface wave spread out in the upper layers of the earth's surface, horizontally only.

It was also shown that depending upon the nature of the earth's surface, and the relative amounts of absorption in the air and in the earth, the surface wave at great distances from the sending station might be much the larger of the two. But since the station that sent out these waves consisted of an antenna high in the air, with one end electrically connected to the earth through the transmitting apparatus, the early wireless investigators, including Marconi himself, used the same antenna and ground system for receiving the waves. It seemed reasonable to suppose that the surface part of the wave was unimportant, and would ordinarily be entirely dissipated at only a very short distance from the transmitter.

The system was used to a considerable extent during the war, communications from the high-powered stations in Europe being received here on underground-antenna systems constructed at Belmar, N. J. The navy station at New Orleans was also so equipped on account of the severe static which is encountered there. American



A Wireless Station of the New Type on a Pier near the Mouth of the Potomac River: The Operators are Sending Messages to, and Receiving Messages from, Under-Sea Craft Submerged Some Distance off Shore



Interior View of Doctor Rogers' Laboratory in Hyattsville, Maryland, Where He Conducted Investigations and Experiments Which Undoubtedly will Result in Every Large Wireless Station being Equipped with a Receiving Antenna Placed Underground

submarines have also been able to keep in touch with their base of operations, even when submerged, by using the trailing wire. It has further been found possible to transmit from these buried and submerged antennæ, but so far only short distances have been attained. This, however, is not nearly so important as the fact that signals may be received from greater distances.

Those who have been following developments in wireless will remember the remarkable results which were obtained, in 1912, by Edwin H. Armstrong, then a student at Columbia University. Armstrong used a very long antenna consisting of a single wire supported 20 or 30 feet above the ground on a line of telegraph poles. In the fall of 1918, another investigator announced that these low antennæ, such as Armstrong used, were quite as effective as the high ones for transmitting as well as receiving. Now Doctor Rogers tells us that wires buried in the ground are, in certain cases at any rate, better than either of the two earlier forms for receiving. And last of all comes the statement by Nikola Tesla that wireless messages do not travel in the air at all, but that the wave that is actually received has traveled directly through the ground from the transmitter to the receiver. When these investigations have all been concluded, perhaps we shall see all the costly towers and masts taken down and replaced by buried wires. The navy experts do not believe that the high aerials can be dispensed with for transmitting. But the radio world has been set to thinking along new lines, and is at the same time going ahead with exhaustive investigations. It is not too much to prophesy that in the very near future every large wireless station will have a receiving antenna in the ground.

CLASSES IN TRACTOR DRIVING FOR CALIFORNIA BOYS

That the state may have a sufficient number of tractor drivers to cultivate the maximum amount of land, and so increase the food supply, the California State Board of Education has been conducting emergency classes in tractor operation in the rural districts. The course given lasts three weeks and costs only $2.50. The first week, the students are taught the theory and principle of gas engines; the second week, the assembling and disassembling of tractors, their operation and repair, and the third week they drive tractors in the field.

MYSTERIOUS "P. V." MADE MINED WATERS SAFE

The Germans were repeatedly baffled, during the war, by the fact that British ships were able to move through mined waters with immunity. It now develops that a cunningly devised machine, in use since 1916, and known to British sailors as a "P. V." or "paravene," was largely responsible for this. The device, the nature of which was one of the mysteries of the war, is torpedo-shaped, with finlike projections either side of its head and a special rudder which regulates the depth at which it travels below the surface. A cable connected with the ship controlling it caused mooring ropes of mines to travel toward the nose of the "P. V.," where a saw quickly severed them. As the mines rose to the surface they were destroyed before doing any harm.

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A Paravene Used in Cutting the Mooring Ropes of Mines So That the Allies' Ships could Pass Safely through Waters Which the Germans Supposed had been Made Impassable

SEWER RUNS ABOVE GROUND ON CONCRETE TRESTLE

A concrete sewer, made of 15-in. and 18-in. reinforced-concrete pipe, runs for 4,000 ft. above ground on the outskirts of Columbia, S. C. The pipe is supported by a reinforced-concrete beam, 12 by 16 in., run on a trestle of concrete bents, 20 ft. apart. Bands across the top of the pipe are bolted to the supporting beam to resist the vertical, lateral, and twisting strains of flood water, which at times covers the pipe. The exposed sewer is part of a recently laid system of 6¾ miles, the balance of which is of the usual subterranean type.

PLANT TO PRODUCE ARGON FOR ARMY BALLOONS

The important part which balloons play as an adjunct of both the army and navy has caused those two branches of our government to share the expense of constructing a plant at Fort Worth, Tex., for producing argon from natural gas. Argon is a noninflammable gaseous element of great value in preventing fire and explosions which are apt to attend the use of hydrogen. The latter is much used in inflating lighter-than-air craft. A line of 10-in. pipe, capable of withstanding high pressure, is to be laid underground to Fort Worth from certain natural-gas wells situated 94 miles to the north. Materials for this undertaking costing $1,050,000 have already been purchased. The plant is not being built near the wells, because they are too remote from water, power, and the labor market. After the natural gas has been processed at the government plant for its contents of one per cent argon, it will be discharged into the Fort Worth and Dallas city mains.

KNITTED STUMP SOCKS FOR WAR CRIPPLES

Stump socks are knitted articles for which a large need has been created by many a soldier's loss of a leg or an arm. They are knitted much like ordinary socks but without heels and are straight throughout. The article is worn over the bandaged stump to give it additional protection. Different patriotic organizations, including the Service League for the Handicapped, has undertaken to supply these socks. In some cases they are made with a draw string by which the top can be gathered. Others do not have this feature.

COMMENT AND REVIEW

[These pages were printed January 23, 1919]

Wireless to Other Planets

FURTHER development in wireless promises to take first place in scientific interest. Experiments with steel tubes in place of glass tubes reveal possibilities of wave projection far beyond the most sanguine hopes of a few years ago. Apparatus already constructed yields a projecting force sufficient to reach around the earth three and one-half times. Marconi in a recent interview even suggests ultimate communication with other planets. Until recently the distance a wireless message could be sent was largely a matter of power at the sending station. Even this will doubtless yield somewhat to improved apparatus, for it will be remembered when the first Atlantic cable was completed, the operators failed to get results at first, due to too much "juice." Cell after cell of battery was added to no avail until some one suggested trying the line with only a few cells—which worked.

The very thought of communication with other worlds opens up such endless possibilities of knowledge as to constitute the most alluring task to which science has ever set its hand. Ours cannot be the only inhabited world, and with all our vaunted learning and mechanical accomplishment, we may in fact be the merest beginners in comparison.

We cannot dream of the mysteries to be revealed, or the knowledge to be unfolded. In other worlds, have they eradicated sickness and pain; have they thousands of years ago discarded our best methods of transportation, communication, heating, cooling, eating, clothing, and agriculture? Of what shape and size are their bodies; how long do they live? Has Christ yet appeared to them, or are they living in a millennium? When we establish communication, will the knowledge we obtain be all useful and helpful, or shall we be made unhappy and dissatisfied with our own conditions because incapable of attaining to their high degree of life? Questions and conjectures can be multiplied so indefinitely as to stagger the imagination.

It is entirely possible that other planets have had intercommunication for centuries, and that we are still in the beginners' class. Marconi states that waves have been detected on their receiving instruments which could not be accounted for as coming from any station on this earth, nor from natural sources, and which are believed to be signals from another world trying to establish communication with us.

The Future of Wireless

WHEN Marconi reached out into the ether, and grasped the waiting secret of sound waves, he unfolded a mystery destined to save the lives of thousands who "go down to the sea in ships." Like most other good things, wicked men perverted his system to unholy purposes, for without wireless the Hun submarine would have failed in much of its cruelty. The war, however, gave a great impulse to wireless, which recently found its culmination in those wonderful instruments which enabled our ground officers to converse with our airmen, while aloft, even at a distance of five miles. That this distance will be extended under the more favorable conditions of peace, may be confidently expected. With the censorship relaxed we may count on wireless stories of actual accomplishment on water and in the air, more thrilling than Jules Verne ever dreamed of.

Before we entered the war thousands of keen-minded high-school boys, and some girls also, had mastered the rudiments of wireless operation, and were sending and receiving messages from points many miles apart. This voluntary self-instruction justified itself, for the sudden demand for thousands of wireless operators found hundreds already prepared, and thousands so nearly so that their necessary instruction to qualify as radio operators was comparatively brief.

With our entrance in the war, the wireless outfit which in city and country towns was everywhere indicated by wires stretched from house to house, or house to barn, became a positive menace. It put into the hands of the enemy in our midst a simple and dangerous weapon; hence the only recourse was to abolish all wireless in civilian hands. Its possession in an operating condition was like owning a moonshine still.

It may not be expedient as yet to lift the embargo on amateur wireless, per-

haps not before the Peace Conference has finished its work and the treaty is signed, but it is to be hoped that at no distant day Young America may again rejoice in that most fascinating of all instructive amusements a boy ever had. It may doubtless be desirable still to control the use and ownership of wireless outfits, by permit from the Government, but that would not prevent its use by those who deserve to enjoy it. With one's loyalty established, the only further objection would seem to be in the ability to read messages of a business or confidential nature, but this too, doubtless, can be safeguarded. If possible the boys should have their wireless.

The commercial feature of wireless has been somewhat lost sight of during the war, but may now be expected to assume a greater importance than ever. Recent improvements of a most important nature promise greater speed and accuracy with greatly increased possibilities as to distance, by day as well as night. Marconi announces his expectation to reduce ocean rates far below the present cable tolls.

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The Government in Business

THERE are some things which the Government must necessarily do, and there are other things which it seeks to do. Outside of those few things which are essentially the function of a government to do, what is there it has ever done, which has not been or would not be better done, and at less cost to the people, by private enterprise? In order to make a showing a government may reduce the price of a service, but it so reduces the value of the service, that the apparent saving becomes instead a high ultimate cost to the consumer.

As a war measure the country cheerfully accepted the taking over of the telegraph lines. Under the circumstances a restricted service was to be expected. The continued operation of the telegraph and telephone service by the Government, promises increasing inefficiency. It is the logical, inevitable result of permanent Federal operation. Anyone who ever attempted to use the telephones of England and the continent before the war knows what a fearful exasperation they were. The explanation is simple. A government employe quickly comes to feel a certain sense of security in his position, and a corresponding indifference to the loss of that position through inefficiency. Especially so with us, where the majority of government positions are secured through a "pull." The feeling is that the pull which placed one there can and may be depended on to keep one there. We are speaking not of cases of dishonesty but simply of inefficiency. Go into any Federal office where a considerable number of clerks are employed, and compare the morale with that of a civilian enterprise with an equal number of employes. In the first there are laxness, deliberateness, and usually some actually doing nothing. Repeated visits will prove the condition is the usual one. On the other hand, the employes in a civilian establishment are active and busy, with a minimum of lost motion. Here individual effort, worth, ambition, results, are the measure of continued employment and advancement. Under Federal operation individual ability seldom counts as much as the pull, hence little incentive to doing one's best.

This atmosphere of security together with the endless red tape which prevents quick action and a short cut to results make for expensive operation. In conducting a war, cost is seldom considered; the emergency is taken to warrant any cost. Under peace conditions there are few such emergencies, but the principle of disregarding cost remains. A corporation must constantly watch for leaks and wastes, find them promptly, and stop them instantly. No such requirement exists in Federal operation—in fact the government treasury seems so huge it is hardly worth one's while to raise disturbing questions which, more often than not, instead of being appreciated turn out to be an unpleasant boomerang. It is not actual dishonesty, in the terms of a defaulter, or even graft, which makes government operation unprofitable; it is the loss which comes from continuous low estimate of one's obligations as an employe. The immediate head seldom has the authority, or is permitted, to discharge utterly inefficient help, for that ever-present pull restores them after a few days with more than a hint not to repeat the "mistake."

This condition is general, as anyone can easily determine. It may not be

possible to correct it, but there certainly is no need or excuse to enlarge its sphere.

The ocean cables were recently taken over by the Government. During the entire war period, since 1914, the cable companies, even with the tremendous burden of war messages, managed to furnish a very acceptable business service. One high official stated a few days ago, it had been possible even to send a message from San Francisco to Japan and receive a reply within an hour; now, under government operation, the same service is a matter of days, as many as seven days in some cases. To continue Federal operation of telephones, telegraphs, and cables would be little short of calamitous to business interests. With reasonable restrictions, the corporate operation of these utilities will be a better service at less cost than the Government can ever hope to attain. Except as a great provider of jobs for political appointees, there is nothing the Government cannot secure from the wire systems under corporate operation it could hope for by conducting the business itself. As for the employe, unless he is a rank slacker, his chances for recognition of meritorious service are all in favor of corporate management.

The fewer government employes consistent with actual necessities, the better, and the less the cost for the people. All the great business enterprises recognize this. The steel companies buy many things they need, cheaper than they can produce them in their own plant. Railroads do not make their own car wheels. A great standing army of government employes is as bad as an unnecessarily large standing army. Each is a burden on the country; consuming without producing.

To add the wire systems would be to increase their cost while decreasing their efficiency.

Competition makes for the best at the lowest practical price. We had better spellers in those days when the class used to toe a crack in the floor and "spell down" than we have ever had since. Under government operation there is no competition. The one or two per cent saved in interest charges on capital account are eaten up many times by increased cost of operation.

THOSE who make no pretense to a knowledge of political economy, and even the saner class of socialists, are gradually coming to understand the utter hopelessness of Bolshevism. To put oneself, and family, and property, in their keeping is to put to sea in a storm in a leaking boat, with an insane pilot. No prominent Bolshevik has ever demonstrated his ability to rule wisely or manage public affairs. On the contrary, Bolshevism is essentially destructive, both to life and property. It is entirely an experiment, with as much promise of desirable results as one expects from a drunken man letting off firecrackers in a powder magazine.

Bolshevism

Bolshevism has destroyed hundreds of houses and barns; it has not built one.

Bolshevism has burned countless warehouses filled with supplies; and factories, and workshops. It has never planned, or erected, one to take their place.

Bolshevism has tortured and killed untold numbers; it has never brought security, and protection, and a steady income to one workingman.

Bolshevism has drained no swamps, has irrigated no barren land; it has no schools where little children may learn, or sanctuaries where man may worship. It recognizes no God, and no rights but those of its own brute strength. Like any other ferocious animal, it can, in a moment, tear down, and in pieces, the work of years; but not in a century can Bolshevism build up and create. It offers nothing whatever to make the world a better place to live in; it brings only apprehension, fear, famine, and despair.

It is an ignorant mob indulging in a wild, prolonged debauch, and must eventually and inevitably perish from its own lack of cohesion.

If every man, woman, and child in the world was an active Bolshevik there would shortly be none left alive, for they would rend each other in pieces, and the survivors would die under the tumbling ruins of civilization. The avalanche, the earthquake, the tidal wave, and the cyclone are all demonstrations of irre-

sistible power; they are awful, fearsome, and sweep away everything in their path; yet none of them endure.

Let any who incline toward Bolshevism think on these things.

Does Army Life Make for Inefficiency?

"PUT him in the army and make a man of him," is a quotation which antedates the recollection of the oldest inhabitant.

The regular life, the physical training, the respect for authority, the prompt response in action and word, the military bearing; all these and many more attributes attach to our lifelong picture of the soldier who was once even a sluggard. Army life was supposed to work wonders, if not almost miracles.

The foregoing is true and it isn't.

What is the general experience of the business man and manufacturer who is bending all his energies to make a place for the soldier returning to civilian life? In most cases he is really in need of man power, either to fill vacancies or to replace boys and young women in occupations for which the latter are partly or entirely unsuited. In some cases the position is more or less a created one. Both types of employer are trying patriotically to coöperate with the War Employment boards, whose function it is to find work for mustered-out men.

The remarks immediately to follow are not intended to apply to the boys returning from overseas, for not enough of them have at this date been restored to civilian occupations to afford any fair judgment. We refer instead to the boys who are daily being released from camps and cantonments in this country. Some have been enlisted only a few months, others a year. What is the present efficiency of these returning men? And what is the reason for the mental condition in which they are returning? For exactness, let me describe the few examples within my own personal knowledge.

Here are three young men around 21 years of age, of good families, with high-school education, who left positions with high-class manufacturing concerns, to enlist. These concerns are known to retain in their employ only bright, efficient young men. It is fair to presume that they were 100-per-cent efficient in their previous positions. What is their efficiency now? Physically they are in the pink of condition, but they appear to take no interest in their work; in moving about they walk at a funereal pace, with a lazy shuffle; they display no initiative; they arrive late in the morning; they do their work indifferently and carelessly; their production is about half what normal production should be. Not a little of their work has to be done over a second time; they resent friendly criticism, and finally, after a few days, they quit. Another employer tells me that of 17 men sent him, all had quit before the end of the week, and the next week, out of 11, only one remained to draw pay Saturday. During the time they worked, their efficiency was very poor. Each of the 31 men mentioned had been a private. Other employers state they are having the same experience. The condition would appear to be general.

It is doubtless unfair to condemn the boys for this unfortunate condition in which they find themselves, for they are not entirely to blame. It is probably the result of the reaction which will take some time to overcome. Perhaps, and even probably, if the men in this country who had been busy each day with drills and camp work could have been demobilized on November 12 and immediately sent home, results would have been different, or at least modified. But there has elapsed two months of inactivity, with the relaxation of morale which accompanied the knowledge they were not going across, and hence an inevitable loss of interest in everything pertaining to camp life and work. An old-line army officer would have felt it less, but the thousands of civilian officers naturally shared the same feeling as their men. "It is all over, so what's the use!" explains matters. A young sailor of my acquaintance who was in a naval camp tells me that for weeks prior to his discharge his comrades actually begged for something to do. What then, must be the effect of enforced idleness on the thousands who may not be mustered out for weeks or even months to come?

The reaction from the superactive military life to one almost purposeless naturally carries the pendulum over to the opposite extreme, and as with all extremes, normal conditions are upset for a time. Then gradually comes a return toward normal. This takes time; it simply cannot be accomplished in a moment.

In the case of officers, who are supposedly better educated, a stronger mental balance may be expected, but even here there will be some disappointments. To both officers and privates the change to civil life is marked. The officers have become accustomed to much order giving and exhibitions of respect from their men; the men have enjoyed the many favors and courtesies extended because of the uniform they wore. To all of them has been offered a good deal of hero-worship sentiment. As they get back on their old "jobs" they are going to miss all this, and for awhile will feel as if they are not being suitably appreciated.

The thought which comes to me in this connection is, first, that employers having these conditions in mind should exercise as much patience as possible, and by talking with the returning men suggest to them the necessity for an extra effort on their part to make good; that it will come a little hard at first, just as the first few drills were hard, but by earnest effort they can soon bring themselves back to old-time efficiency. Second, that the men themselves take a mental inventory of their own feelings, and reluctance to work, which is not unlike that of the small boy in his first week at school after the long vacation. The old tasks seem an awful drudge, but after ducking under a few times they find the water is fine.

So, Soldier boy and Sailor boy, if the old job seems hard, or stale, or uninteresting, don't give yourself up to careless indifference, but exert just a little of that splendid spirit you had built up for use "over there" and conquer yourself with the same irresistible force with which you would have gone after the Huns; and of the two efforts, I am not at all sure that bringing yourself up to concert pitch again in the requirements of civil life is by any means the lesser or easier task. You will do it, for it's in you even though a bit rusty; and when you once realize what our own country and the world demand of our man power in peace, and the wonderful possibilities opening to us as individuals and a nation, you will be just as keen to get to the top as you were a few months ago to "go over the top."

The Victory Loan

DID you ever live in a country town whose fire department was composed of volunteers? And did you ever notice how keen everybody was to run with the cart and help lay a line of hose, and what a scramble to hold the nozzle? But when the fire was out, the crowd dispersed, and few were left to be impressed; the most officious disappeared on one excuse and another, leaving the few faithful, conscientious workers to clean up. Of course there isn't any excitement in reeling up a lot of wet, dirty, cold hose, but it has to be done after every fire; and those who should, and don't, are slackers.

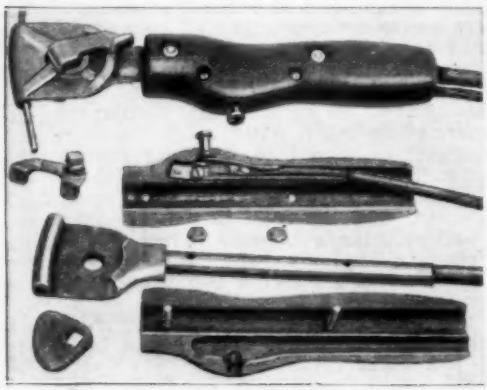
Six months ago the prospect was that the Government would be obliged to put out a big Liberty loan every three or four months, for an indefinite period. Happily this has not been, and will not now be, necessary. The fire has apparently been subdued, the world conflagration has been checked, the gale which drove the sparks every way is subsiding, and we hope the danger is over. Now there remains the hose to gather up, and some of it to replace, with comparatively few ladders that were lost or broken; but taken altogether our loss has been small compared to that of other countries. In fact, it might with propriety be called a "Thanksgiving" loan. As the Victory-Liberty loan it offers the double opportunity of celebrating the great victory, and also as an expression of thankfulness that we did not have to go on for months and years at an awful cost of precious lives. Any sacrifice of mere dollars in order to put the loan over promptly is so insignificant compared to the price we might have been called upon to pay, that the nation should cheerfully shoulder the load. Had the war continued, even this country with all its money and resources would have soon felt its depressing effect. Because the living of our usual life has been so slightly interfered with, few realize the many sacrifices that would soon have been necessary. For these reasons alone we should put the loan over quickly, patriotically, willingly.

Picking up the hose isn't an exciting job, but we must not say to the world we are slackers by failing to do so, even though we lack the excitement of daily combat to spur us on.

H. H. WINDSOR

ELECTRODE QUICKLY CHANGED IN NEW ARC-WELDING TOOL

A handy arc-welding tool has recently been devised, one of the advantages of which is that the electrode can be changed with little loss of time. In case the electrode adheres to the work the necessary amount of pull can be exerted on the former without dislodging it from the grip of the tool. The current enters a shank inclosed in a handle of insulating material and passes to a broad, flat head having a curved flange at its outer end. The electrode is clamped between this flange and a movable member controlled by a small lever. When remote control is employed with a closed-circuit system, the tool is provided with a trigger projecting from the side, by which the current can be turned on and off.



An Arc-Welding Tool, Having a Head So Designed That the Electrode can be Changed Quickly When Desired, and Its Parts

¶ Makers of gold-filled, plated, and gold-shell rings have agreed to adopt a standard system of marking devised by the Bureau of Standards, which will tell, by means of a fraction before the usual carat mark, what part of the entire weight of a ring is composed of gold.

AMERICAN BATTLEPLANE SETS NEW SPEED RECORD

By H. A. MOUNT

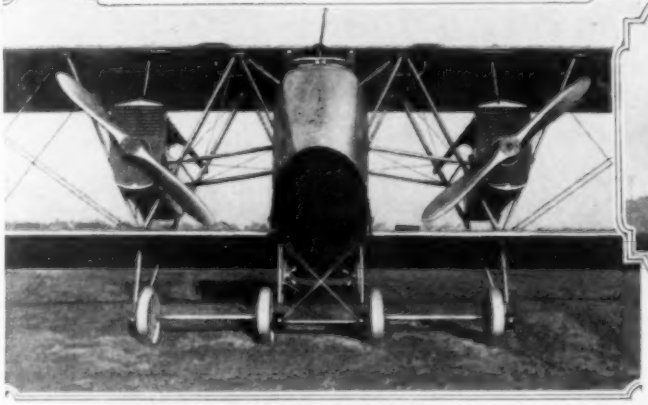
HAD the war lasted until spring, German pursuit pilots probably would have been surprised to see a fleet of great bombing machines sail unconcernedly into "verboten" territory in broad daylight. And the Hun pilot who attacked, expecting an easy victory over his unwieldy antagonist, would have received the surprise of his life. For the great bomber would have proved as fast and as agile as his own smaller machine and would have been protected by five machine guns that covered every possible angle of approach.

As it was, only a few of the great fighters got into the hands of the army fliers, and none of them reached the firing line. But official tests showed, in spite of great size and enormous carrying capacity, the plane was so versatile that it could have been used to equal advantage as a pursuit machine and as a day or night bomber. The great 75-ft. plane is said to be the first of its size successfully to perform all the acrobatic "stunts" required of a pursuit machine. Not long ago it flew from Dayton to Cleveland, a distance of 215 miles, in 1 hr. 15 min., thereby establishing what is believed to be a new world's record. The average speed during the flight was 172 miles an hour. The fastest trip previously made between these two cities occupied two hours. The tools, fuel, and baggage carried by the plane weighed 2,500 pounds. The machine is known as the Martin gun machine and was designed by Glenn L. Martin. It was the first all-American design accepted for battle use, and was just getting into production when the armistice was signed. The plane, however, is easily adaptable to commercial requirements; a passenger machine with a capacity for 12 persons and a freight-carrying machine with a two-ton capacity are now building. They are altered from the military design only as to interior equipment of the fuselage.

In the passenger plane, upholstered seats are arranged side by side within an inclosed cabin, provided with windows. Entrance is by a trapdoor and folding steps through the cabin floor, just back of the wings. The freighter will first be used in mail service.

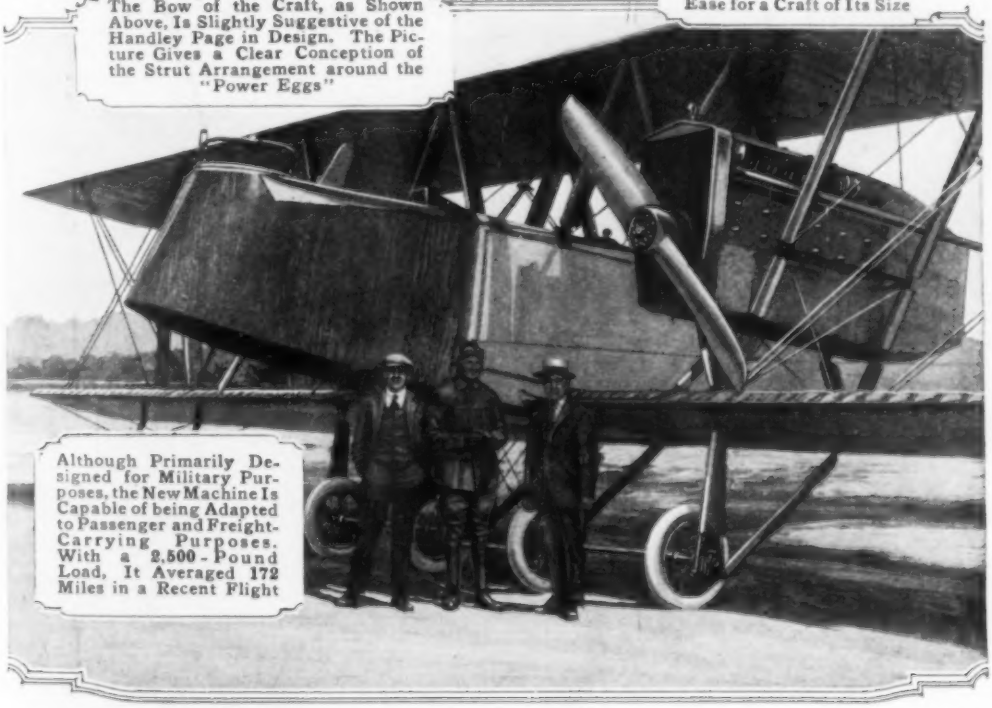
As compared with the English Handley Page, the Martin plane has a 75-ft. wing spread, instead of a 100-ft. The total weight is slightly over half that of the English design. Driven by two Liberty motors, it has a guaranteed speed of 120 miles an hour, while a Handley Page, with the same power plant, makes about 80 miles an hour.

Both the Double Rudder and the Ailerons on Top and Bottom Wings Are Visible in This Rear View of the Fast Battleplane. It will be Observed That the Machine Is of Noticeably Lighter Construction Than the Handley Page, and, of Course, Also Smaller



The Bow of the Craft, as Shown Above, Is Slightly Suggestive of the Handley Page in Design. The Picture Gives a Clear Conception of the Strut Arrangement around the "Power Eggs"

In Flight the Plane Is Graceful and Nimble. It Responds Quickly to the Controls and Executes "Acrobatics" with Unusual Ease for a Craft of Its Size



Although Primarily Designed for Military Purposes, the New Machine Is Capable of being Adapted to Passenger and Freight-Carrying Purposes. With a 2,500-Pound Load, It Averaged 172 Miles in a Recent Flight

TORPEDO-CARRYING PLANE OF BRITISH DESIGN

Dropping a torpedo of the usual naval design from a flying airship, instead of shooting it from the tube of a torpedo

PHOTO BY DAILY MIRROR

This British Torpedo-Carrying Airplane has Just Released Its Weapon, Which the Camera Caught Before It Entered the Water

boat—an idea that the British war department put into practical shape just before the signing of the armistice—cheated the Huns of a new experience. The 150-mile headway of the plane provides the initial energy for starting the torpedo on its course, the plane flying straight toward the enemy object, at a 50-ft. elevation, as it lets go its formidable underwater projectile. The special problems solved were overcoming the dangerous reaction of the plane, suddenly lightened by its loss of a ton weight, and the tendency of the torpedo to strike the water at an angle. Both these actions were disastrous in early experiments. Twenty of these torpedo planes, on a mother ship, guarded the surrender of the German fleet.

SIBERIAN FUR DEALERS SEEK AMERICAN MARKETS

The turmoil in Russia having practically closed the Trans-Siberian Railway for trade purposes, fur dealers in Siberia are now endeavoring to get in direct touch with American and British markets. Before the war they had built up a large business with firms in central Europe, which is now disorganized. Reports coming to this country from dealers in far-off northern Asia tell of fur trapping by natives on a scale the magnitude of which few Americans realize. Siberia being practically cut off from territory to the west, the fur trade of the whole region, it is said, is now being concentrated in Manchuria.

BY COURTESY OF THE FUR TRADE REVIEW

A Fur Trader and His Employes in Manchuria, China, Inspecting a Shipment of Goods Received from Mongolia: The Man Standing Third from the Right is Examining a Large Fox Skin

PHONOGRAPH LURES SEALS WITHIN RANGE OF HUNTER'S GUN

KILLING seals enticed within gun range by a phonograph is the unusual practice which a hunter, frequenting waters bordering the states of the Pacific Northwest, has found very profitable. The instrument, which is of a size that can be easily carried about, is set up near the rendezvous of the animals, and soon its music attracts their attention, and they lift their heads well above the water. The hunter reports that he has been able to shoot large numbers of them while they are under the spell of the sounds so strange to their ears.

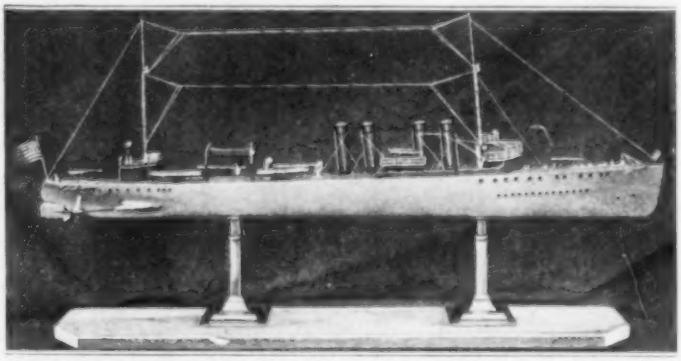
NEW MATERIAL FOR MAKING ARTIFICIAL LIMBS

Several advantages, among which is decidedly lower cost, are claimed for a celluloid substitute used in making artificial limbs. This substance is prepared by mixing equal parts of water with a certain make of glue, producing a cement which is applied to muslin in the same manner as when making celluloid arm and leg appliances, namely, while winding it about a plaster cast. The substitute is said to be light, strong, and noninflammable.

¶A tax of two cents a head on all cattle and sheep in Natrona County, Wyo., producing a fund of $6,000 to $8,000, will be used for the eradication of coyotes, wolves, bobcats, and other predatory animals, under the supervision of the United States Biological Survey.

SHIPBUILDERS GIVE EMPLOYER MINIATURE DESTROYER

A much-appreciated gift recently presented to an official of an eastern shipbuilding concern by his employes—a memento made by their own hands—is a 39¾-in. model of a destroyer. It was built on a scale of ⅛ in. to the foot, and every external detail of the original was reproduced with the greatest care.



Model of a Destroyer, Approximately 40 Inches Long, Made by Workers in an Eastern Shipyard and Presented to an Official of the Company; Every External Feature of the Original has been Faithfully Reproduced on a Scale of One-Eighth Inch to the Foot

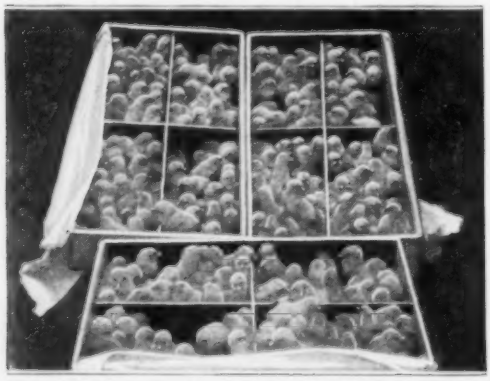
FULL OF WATER AND PEOPLE BOAT STILL FLOATS

A lifeboat which cannot be sunk by any ordinary means is provided by fastening blocks of buoyant composition to the sides of a folding frame, making the boat collapsible for storage or shipment. The sides, of flexible material, are attached to the keel and to the stern and bowstems, which latter are pivoted at the ends of the keel to allow movement as the sides are expanded or collapsed. Folding spreader members hold the boat rigidly expanded and serve also as seats. They are locked, and released, by a quarter turn of a shaft extending through one end of the boat. All outside surfaces are covered with waterproof material, and the buoyant composition is put on in sections, for easy replacement or repair in case of damage. The whole is covered with canvas for protection. A test model with several plugged holes in the bottom was loaded with three passengers and 500 lb. of lead. When the plugs were withdrawn the boat filled with water and settled slightly, but a large portion of its bulk remained above the water line.

Three Men and 500 Pounds of Lead Failed to Sink This Boat When the Plugs were Removed to Let Water In. It is Made of a Buoyant Composition, and Folds Up as Shown

SHIP BABY CHICKS SAFELY, HUNDRED IN A BOX

Packing boxes for shipping baby chicks a day old are successfully being used by a New York State poultryman. The form of box used, devised after considerable experimenting, is divided by partitions into four compartments. Each compartment carries 25 chicks, or 100 to the box. Muslin tops tacked on give plenty of air and protection from draft, the partitions prevent crowding or smothering.



These Boxes, with Muslin Tacked on Top, are Used for Shipping Live Day-Old Chicks. The Partitions Prevent Crowding

BRITISH ARMY PLANS TO SELL VAST NUMBER OF HORSES

During the war little was said about the great numbers of horses—many of them prized English mounts—used by the armies in France, but now many interesting facts are being made public. Great Britain is planning to dispose of 750,000 horses, 700,000 of which were brought from North and South America, Spain, northern Africa, and elsewhere. Just how the sale of so many horses can be managed without bringing prices below actual values is something of a problem. In fact some Britishers, with characteristic humane regard for domestic animals, would prefer that all horses not brought back be killed rather than permitted to fall into the hands of persons who might treat them brutally. It is proposed to return at least 17 per cent of them to England—the equivalent of the number taken from that country. Doubtless many will be disposed of in Belgium and France. The losses among the horses were heavy, being 12 per cent for the last four months of 1914, approximately 14 per cent for both 1915 and 1916, and 28 per cent for 1917. Last year the losses were surprisingly small, amounting in the 10 months of war to only two and one-half per cent.

EXPLOSION OF MILLION-GALLON MOLASSES TANK

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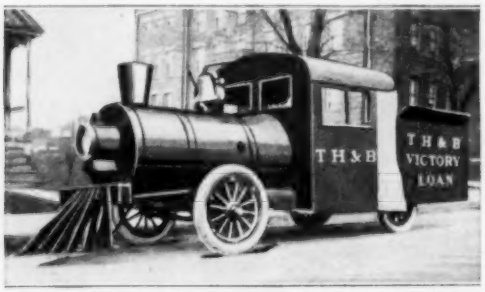
THE explosion of a huge molasses tank in a Boston freight yard utterly demolished several buildings, tore away two elevated-railway supporting pillars, blew an electric car off its track, and overturned a number of heavy trucks. The blast killed at least 10 persons outright and injured scores of others, many seriously. A dozen horses were killed. The capacity of the tank was upward of 1,000,000 gallons, and molasses spread over the street two or three inches deep, while the wreckage was covered with it. No violent detonation accompanied the explosion, but the walls of the buildings and other adjacent structures crumpled like paper. At the top of the page and to the left are seen the ruins of the freight yard and wreckage-littered street; below are sailors from the navy yard searching for victims.

LOWER PHOTOS COPYRIGHT INTERNATIONAL FILM SERVICE

AUTO IN PATRIOTIC PARADE HAS LOCOMOTIVE BODY

One of the clever features in a parade recently held in Hamilton, Ont., to promote the Canadian Victory loan, was an



An Out-of-the-Ordinary Feature in a Patriotic Parade in Hamilton, Ontario: The Imitation Locomotive is Made Largely of Sheet Iron and is Supported by a Wood and Iron Framework Inclosing the Hidden Automobile

automobile fitted up to look like a railway locomotive. The top and windshield were removed, and two heavy beams, bolted to the body, were extended 5 ft. to the rear to support the tender. The boiler and cab were of sheet iron. Angle irons were attached to the front of the car frame to carry the front end of the boiler, and special supports were placed beneath the bell which had formerly seen actual use on an engine. The float was entered by the Toronto, Hamilton, and Buffalo Railway Company.

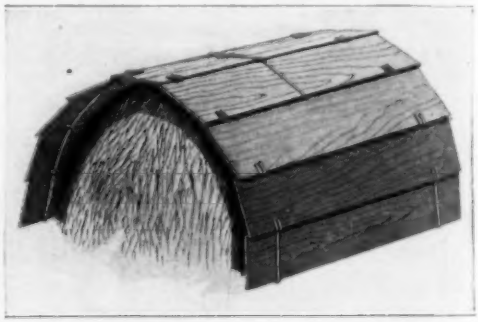
BLAST DITCH THROUGH ROCK TO DRAIN FARM

For the purpose of draining an area of muck land, used for growing vegetables, a ditch half a mile long was blasted through solid limestone in Wayne County, New York. The cost of the improvement, amounting to about $5,000, was met by the coöperation of the farmers benefited. So much limestone débris was produced by the blasting that it had to be piled along both banks of the ditch by a derrick. The ditch lies along the course of a small stream, which, with its capacity thus augmented, is able to keep freshets from flooding the peat soil of the farms, and so adds a considerable area of usable and fertile land to the local vegetable-growing district.

Limestone Was No Barrier to the Vegetable Farmers of Wayne County, New York, Who Blasted This Drainage Ditch to Keep Floods Off Their Muck Land

SUBSTANTIAL STACK ROOF EASILY ASSEMBLED

A covering for grain or haystacks, recently patented, can be easily assembled without the use of hooks or nails, and, when not in service, can be stored in small space. It is made of boards, overlapped like clapboards and held in position by hooks engaging wires stretched over the top of the stack. The hooks for one board



Roof for Peak of Hay and Grain Stacks Which can be Assembled without Employing Hammer and Nails: When Not in Use It can be Stored in Small Space

are so placed that the board below supports them, the bottom board on either side being held by the wires looped about it. Means can be provided for tying the roof down so that the wind cannot lift it.

ZEPPELIN CAN CARRY CARGO ACROSS ATLANTIC, BELIEF

In the opinion of American aeronautical authorities, there is good reason to have faith in the ability of German super-Zeppelins to carry commercial cargoes between Hamburg and New York in accordance with the reported plans of certain Hun interests. Without discussing the rumored project from other than the standpoint of aviation, attention is called to the fact that, according to information deemed authentic, the latest German rigid

dirigibles are about 800 ft. long and hold some 3,000,000 cu. ft. of gas. Driven by multiple engines of great horsepower, they travel, conditions being normal, at a speed of 70 or 80 miles an hour. It is asserted that Zeppelins of this type are able to remain in the air for as long as two weeks without material loss of gas. Furthermore, they are understood to be capable of carrying a useful load of approximately 30 tons. During the war a Zeppelin with 22 men and 25 tons of munitions aboard is claimed to have made a 1,000-mile nonstop flight. On the other hand, the statement is made in a committee report of the air board that dirigibles of more than 4,000 mile range are in existence.

USE CONCH SHELLS AS HORNS FOR PHONOGRAPHS

A feature which makes a new phonograph different from all others is the use of a conch shell for the horn. Shells of this sort are exceedingly hard, with a very smooth inner surface, and it is the claim of the manufacturers of this phonograph that they transmit the sound with greater naturalness and beauty than horns of wood or metal. The large end of the tone arm of the phonograph is attached directly to one end of the shell after a small portion of the latter has been cut off. With a small instrument having an outside horn, the shell stands on end, the sound issuing from the opening in the side. In the case of instruments having concealed horns, the shells are installed at the back of the conical passage from which the sound issues.

The Unusual Horn on This Phonograph Is a Conch Shell, Which, the Makers Claim, Gives the Instrument Exceptional Tone Qualities

ICE CYCLE HAS TWO SKATES INSTEAD OF FRONT WHEEL

An ingenious New York man recently demonstrated that a speedy ice craft can be made by substituting a pair of skates for the front wheel of a bicycle. The skates are held parallel by a crosspiece, from which an upright and two braces extend to the front of the frame. The braces support two small front seats, with foot rests, in which the rider carries two of his little friends. The owner calls his vehicle an "icicle."

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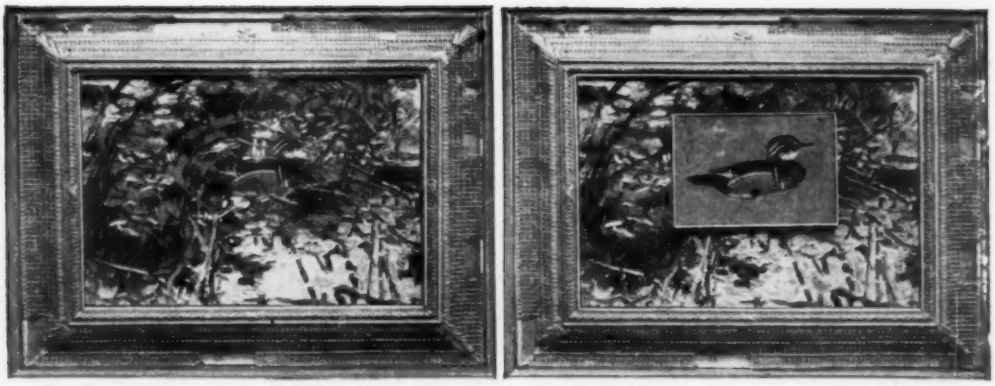
A Vehicle for Winter Sport Which the Maker has Nicknamed an "Icicle": It is Steered with the Handlebars Like a Bicycle

WARSHIPS TO CARRY MAIL, SWEDISH PEACE IDEA

Removing their side armor, protective decks, barbettes, and guns would change battle cruisers into fine mail liners with plenty of room for passengers. That is the proposal which has the approval of the Swedish minister of marine for application to the Swedish navy's two largest warships. The vessels so pacificated would have 2,000 tons dead-weight capacity with a displacement of 4,300 tons and a speed of 25 to 30 miles an hour. Sweden's navy numbers 69 war craft of all kinds, all of which are well designed and constructed, but rather small for actual war purposes. This appears to be the first serious indication of a possible peaceful use for naval units.



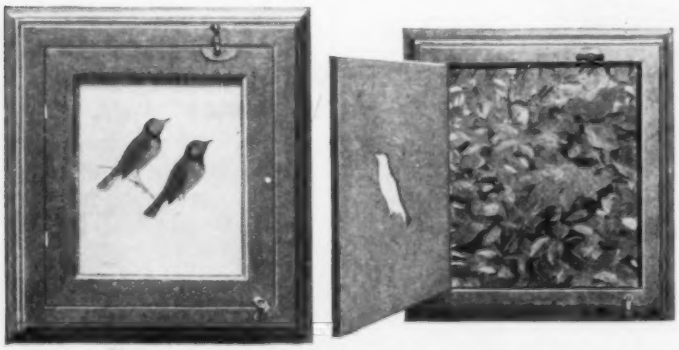
First, Look at the Picture at the Left. It Is an Oil Sketch of a Male Wood Duck at the Border of a Pool amid Vegetation. Failing to Find the Fowl, Look at the Right Picture, over Which a Stenciled Mat has been Placed to Separate the Bird from Its Camouflaging Surroundings

A NEW CAMOUFLAGE ART

By BRANDON TRACY

FOR many years scientists have known that nature has endowed most wild animals with deceptive coloration for the purpose of concealment from enemies. When snugly ensconced in a bed of dried leaves, the copperhead snake is invisible at 10 feet. Zebras, motionless in the sapling brakes of an African jungle, blend with the shadow and brightness of moonlight so perfectly that their only feared enemy—the lion—cannot see them at 30 feet. The wood duck, resting in a baylet with her tiny brood, eludes the hawk because her color scheme matches her surroundings perfectly.

At the Art Institute, Chicago, recently was given an exhibition of paintings of nature subjects based upon these facts.



Of the Two Images of Hooded Warblers at the Left, One Is a Water Color and the Other a Stenciled Silhouette That Makes Visible the Bird in the Picture Concealed beneath the Screen. At the Right the Screen has been Opened, Disclosing the Sunlit Foliage, amid Which the Little Creature is Posed

The pictures, done by Abbott H. Thayer, Gladys Thayer, Gerald H. Thayer, Louis Agassiz Fuertes, and Richard S. Meryman, demonstrate all angles of nature's use of camouflage. The simplest form of this art showed a peacock standing on a stone garden wall amid ivy and tree foliage. The head and neck of the bird is silhouetted against the sky, but the gorgeous plumage—which in another setting would make the peacock a most remarkable target—mingles with the vegetation in such manner that the outlines are lost completely. It takes close observation to distinguish that the picture contains anything except ordinary greenery and foliage such as might be met in any garden.

The observer instantly raises the objection, "Oh, but the artist chose his colors and arrangement. No wonder the bird is concealed!" The new school is ready for just that criticism.

The "rebuttal" is presented in the form of a landscape in the Himalaya Mountains, a picture showing the snow-capped peaks in the distance against blue sky. In the foreground is underbrush, a spiring evergreen tree, and other vegetation. The whole picture is made, not with oils or water colors, but from the feathers of the male monal pheasant! This most brilliant of feathered creatures is the animal above all others one would least expect to own protective coloring, but the artist shows that the pigments its plumage furnishes are identical with those given by nature to the landscape it graces. When

free in this country of mountains it is next to indistinguishable by the eye.

Right in line with the same idea is the picture shown with this article, "Hooded Warbler and Sunlit Foliage." In looking at the unstenciled picture, the observer sees nothing but an array of foliage, played upon by sunlight and shadow. No warbler has been painted in, although this is exactly his habitat.

A cover fits over the painting. In this cover is cut a stencil exactly on the outlines of the warbler. As the observer closes the cover he sees through the stencil a perfect likeness of the warbler, which he can compare, if he chooses, with a sketch from life on the outside of the cover.

This is, naturally, something of a trick picture. It simply reinforces the fact that in the habitat of these birds are all of the brilliant colors of the plumage. The artist has arranged the leaves and chiaroscuro of the painting so the observer cannot mistake the lesson at first glance.

At the Left is Presented a Painting of a Reed-Bordered Pool in the Marshes. It Includes No Image of a Bird, yet by Applying a Stenciled Mat, as at the Right, an Excellent Representation of a Swamp-Dwelling Railbird can be Seen

Camouflage, as used by military forces in the war, was based entirely upon lessons learned from these birds and animals. Man's work in this direction still lacks much, for nature approximates perfection.

FRENCH MOROCCAN TROOPS INAUGURATING THEIR "WATCH ON THE RHINE"

ONE of the many incidents of interest that attended the advance of French forces into Germany, in accordance with the armistice terms, is illustrated by the photograph reproduced herewith. It shows a regimental standard bearer, surrounded by officers and men, dipping a banner in the waters of the Rhine, an act symbolizing the fact that this particular part of the mighty river is under the control of the victors.

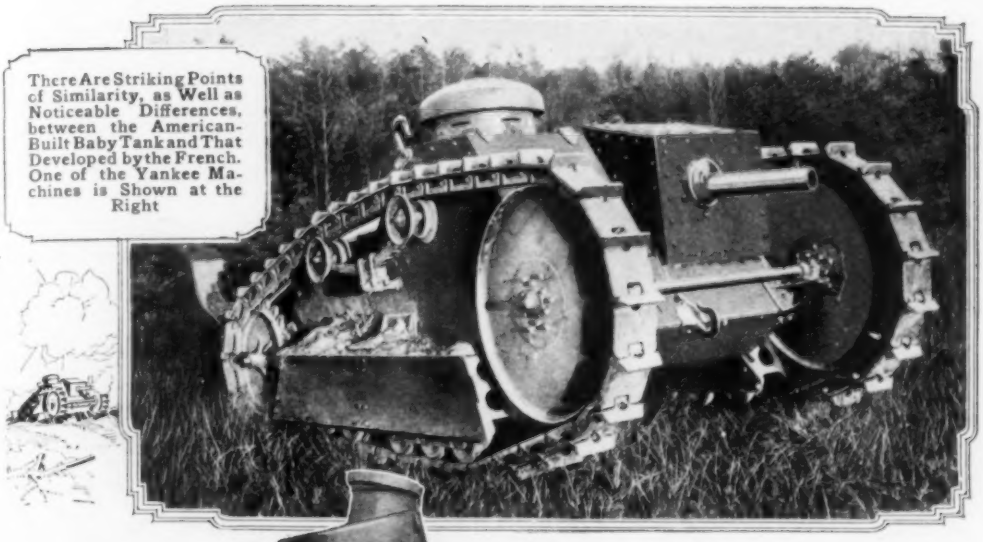
WITH OUR AIR FORCES AT HOME AND IN IRELAND

Few People Outside Those of Our Armed Forces Who were Immediately Concerned Knew That the United States Had a Naval Air Station in Ireland. The Photograph at the Right, Taken from an Aeroplane, Shows Such a Station, from Which Seaplanes Went Out to Fight U-Boats

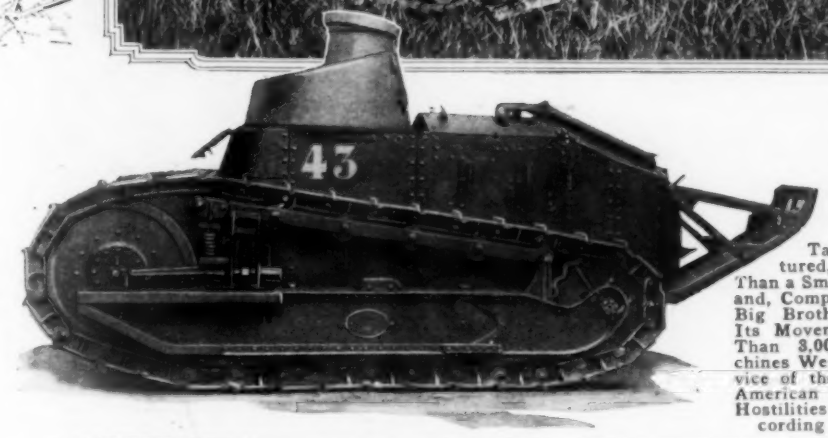
Preparing for a Practice Bombing Expedition: These Fliers are Fastening the Missiles in Especially Devised Holders beneath the Underside of Their Plane, Preparatory to Showing Their Skill in This Particular Kind of Marksmanship

Aeroplanes Are Truly among Our First Lines of Defense. Though These Hundred and More Fighting Planes Are at Ellington Field, Houston, Texas. Here Large Numbers of Our Most Promising Fliers were Trained to Drop Bombs on Hostile Fritzes

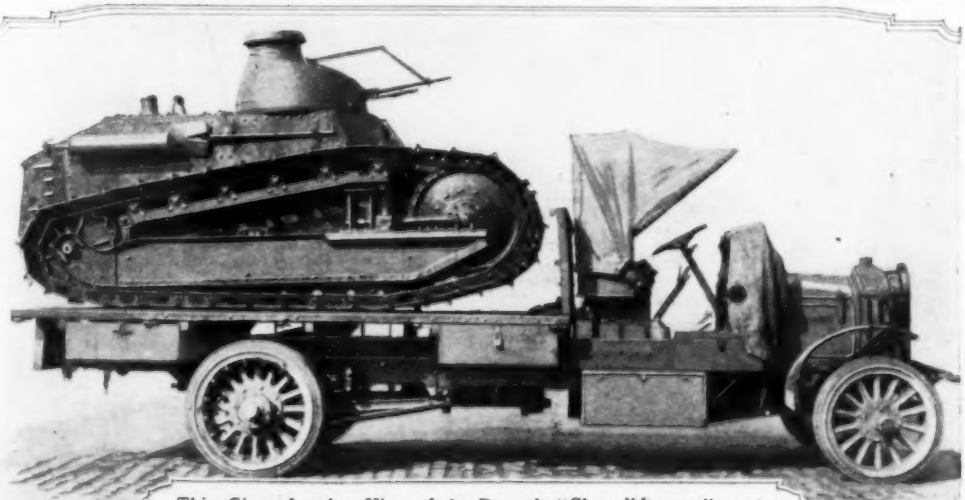
CLOSE-UPS OF FRENCH AND YANK BABY TANKS



There Are Striking Points of Similarity, as Well as Noticeable Differences, between the American-Built Baby Tank and That Developed by the French. One of the Yankee Machines is Shown at the Right



The French Baby Tank, Here Pictured, Is No Larger Than a Small Motor Car, and, Compared with Its Big Brother, Quick in Its Movements. More Than 3,000 Such Machines Were in the Service of the French and American Armies When Hostilities Ceased, According to Reports



This Gives Another View of the Renault "Char d'Assaut," as the Little French Fighter is Known Overseas. The Machine is Mounted on an American Motor Truck, and This, Incidentally, Explains How Quick Transportation of the Tanks from One Position to Another was Accomplished

GERMAN NEWS PICTURES OF TIMELY INTEREST

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To Protect the Former Crown Prince of Germany from Aerial Bombs, This Spring-Held Metal Screen was Erected above the Roof of the Villa Renaudin, Which Served as His Headquarters in the Vicinity of Charleville

FRENCH OFFICIAL PHOTO

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Above, a Yank is Inspecting the Massive Steel Door That Guarded One of the Two Entrances to the Bombproof Dugout in Which the Kaiser Sought Protection at Spa

PHOTO FROM INTERNATIONAL FILM SERVICE

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The Least That can be Said of the Berlin Insurrection Is That It has been Staged with All the Conventional Properties Used in First-Class Revolutions. Here a Sailor is Carrying the Red Flag at the Head of a Revolutionary Procession in Unter den Linden

RETIRING HUNS CROSS FRONTIER INTO HOLLAND

The Photograph Reproduced Above Shows a Long Column of German Army-Supply Wagons Trekking through a Dutch Village After Crossing the Border from Belgium, Following the Armistice Agreement

German Army Wagons, Protected with Red Cross Flags, Assembled in the Public Square of a Town in Holland: The Absence of Motor Vehicles Is Noticeable

Although Affording No Protection from the Elements, This Three-Tier Motor Ambulance, Attached to the Dutch Army, at Least Has the Merit of being Well Ventilated. While It Carries Seven Stretchers, the Difficulty of Handling the Upper Ones Is Obvious

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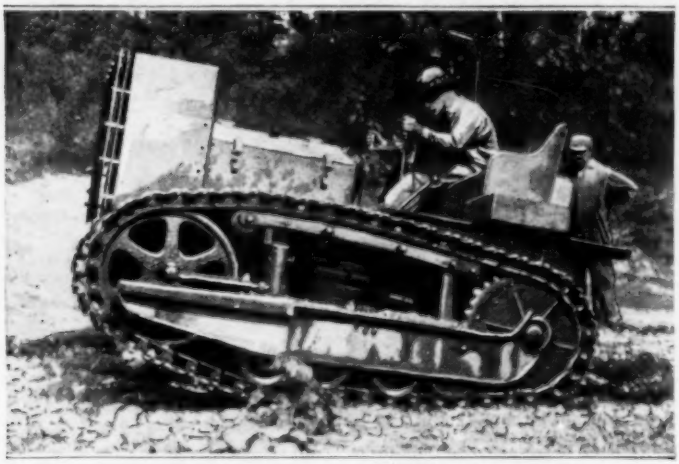
FAST TRACTORS HAUL TANKS TO SPEED ARMY DRIVE

Tractors of the 2½-ton type, equipped with eight-cylinder engines of standard make, were used in the last allied-army drive to reduce road congestion by virtue of their relatively high speed. They were able to haul spring trailers at a steady gait of 14 miles an hour, with a maximum speed of 17. Small tanks of the "whippet" type were frequently placed on these trailers for hauling, facilitating their movement from point to point. By towing 75-mm. field guns on trailers, these useful little tractors aided the army in consolidating its daily gains. Previous methods of moving the tanks and artillery on their own wheels limited their progress to six miles an hour, or less. The tractors are equipped with multiple-disk clutch and three-speed transmission, and the engine, radiator, gasoline tank, and other vulnerable parts are inclosed in armor sufficiently stout to resist machine-gun fire or flying pieces of shrapnel.



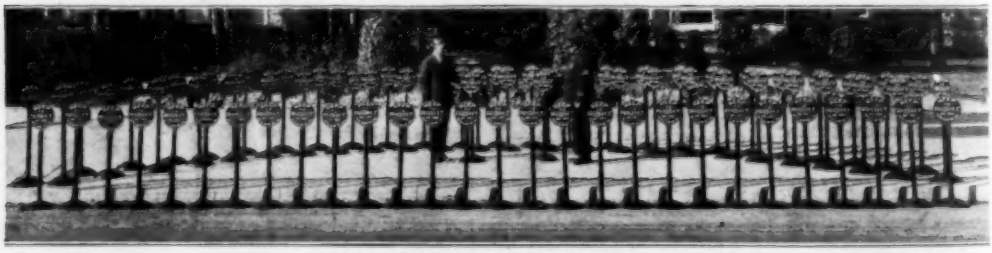
This 2½-Ton Artillery Tractor Has an Eight-Cylinder Engine and can Do 14 to 17 Miles an Hour Hauling a Trailer Loaded with a Small Tank or a "75" Gun

AMERICAN GIRLS RUN SHOPS ON CARS IN FRANCE

Peddling brought up to the minute is a feature of the devastated settlements of northern France. American girls are driving small automobiles over the almost impassable roads, dealing out the necessities of life to the inhabitants of ruins and cellars, whose former accessibility by railroad has gone the way of other ordinary conveniences in that wrecked district. The cars are stocked with the commodities that experience dictates, so that, besides coffee, lard, cocoa, canned meats, condensed milk, and other groceries, it has been found desirable to carry blankets, sheets, pots and tin plates, knives, lamps, brooms, pins, and soap. A driver and saleswoman, working from dawn to dark, can satisfy the more urgent requirements of 50 villages a week.

EIGHTY TRAFFIC SIGNS TO PROMOTE SAFETY

As evidence of its desire to aid in preventing automobile accidents, a local club of motorists has furnished the city of Los Angeles with 80 metal "Keep-to-the-Right" signs to be used as markers of safety zones in the streets, displacing articles of a similar character that had become badly damaged. Each of these new signs has a heavy metal base into which is threaded a 2-in. pipe. This standard is flattened at its upper end and to it is attached a red disk on which the legend is lettered in white.



Eighty Appeals to "Keep to the Right": This Extensive Consignment of Substantially Made Signs has been Supplied to the City of Los Angeles for Use in Marking Safety Zones in the Streets. The Signs are Not Intended to be Fastened to the Pavement but Possess the Necessary Stability by Reason of Heavy Metal Bases

A Fitting Recognition of Departed Soldiers' Patriotism: The Entrance to the County Courthouse at York, Pennsylvania, Showing the Names of the County's Dead Heroes Inscribed on Panels Attached to the Pillars

COUNTY HONORS DEAD HEROES AT COURTHOUSE ENTRANCE

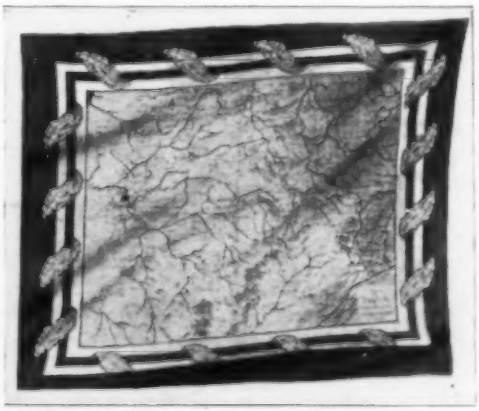
Signal honor has been accorded to the memory of approximately 150 men from York County, Pa., who died in the great war, by inscribing their names on panels covering the front of pillars at the entrance to the county courthouse. An appropriate legend occupies the space above this list. The name of each man, together with his former residence, is lettered in gold on an individual blackboard, which in turn is mounted on one of several black panels. At the time the accompanying photograph was taken the roll of dead had not been completed, but additional data at hand showed that the total would exceed 150—enough to cover the fronts of all the pillars and some space on the sides. The memorial was erected under the auspices of the local chamber of commerce.

CROWDED CABLES TO EUROPE RELIEVED BY RADIO

Wireless—scientific wonder a few years since—now takes its prosaic place as official aid to overburdened Atlantic cables. Government cable messages addressed to Europe are likely to be routed via wireless by the cable companies unless specifically marked "not to be sent by radio." This is particularly true of messages not of a confidential nature. Our increasing intimacy with the other side, threatening to load the cable lines beyond their capacity, led to the service-facilitating order by the postmaster-general to substitute radio when the circumstances made it feasible to do so.

MAP OF WAR ZONE PRINTED ON GERMAN HANDKERCHIEF

Among the much-prized mementoes of the great war possessed by an American doughboy is a large silk handkerchief which was obtained from a captured German officer. On it is printed a detailed map of the western front and adjoining territory. The texture of the handkerchief is such that it can be carried in the pocket without danger of cracking it.



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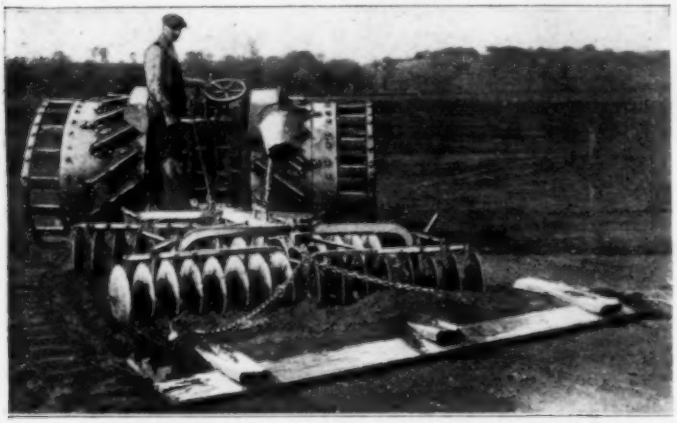
A Doughboy's Trophy Captured from a German Officer: The Map is Printed on a Silk Handkerchief and, Folded, Occupies Very Little Space

EXTENSIONS TO TIRES EQUIP TRACTOR FOR SOFT SOIL

That a heavy farm tractor might be used in cultivating a large field of soggy land, extensions for the drivewheel rims were devised which made the machine practically as efficient on soft ground as those especially equipped with wheels having extra-wide treads. The extensions were fastened to the outer edge of the rims of the drivewheels, doubling their width. They consisted of a broad and a narrow hoop, placed about 12 in. apart and held in place by crosspieces set at intervals of five or six inches.



Farm Tractor with Extensions Attached to the Tires of the Drivewheels Which Enabled It to be Used in Preparing Soggy Soil for Planting: The Track at the Left Shows That the Machine has Scarcely Sunk into the Ground at All

WAR-STAMP BOOTHS EQUIPPED WITH "LIBERTY BELLS"

The privilege of ringing a miniature Liberty Bell, which was accorded each purchaser of war-savings stamps during a recent "drive" in Los Angeles, proved a great stimulus to the campaign. There were 60 of these bells, painted to represent the prized relic in Philadelphia, which were mounted above as many tents scattered throughout the business district. Each ringing of a bell told the crowds in the streets that another purchase of stamps had been made.

INVESTIGATORS STUDY TWIST DRILLS OF MANY TYPES

An exhaustive investigation conducted by the engineering experiment station of the University of Illinois, at Urbana, has determined more definitely than has ever been done before the relative merits of various types of twist drills. A report of this research work, fully illustrated, has been issued by the university. It contains valuable comment on many important aspects of the problem under consideration, including such questions as the power required at the drill point for various speeds, and the endurance of different drills under a variety of conditions. Special apparatus had to be designed for some of the work. This investigation is the first of several relating to metal-cutting tools that have been planned by the experiment station of the school.

CAVERN IN FRANCE REVEALS PREHISTORIC ART

Stone engravings whose antiquity is estimated at 30,000 years have been discovered in an extensive cavern at Montesqui-Avantes, at the foot of the Pyrenees in Ariège, southern France. These ancient pictures appear on the walls of the cave in great profusion and variety, as though the subterranean galleries were once an actual museum of art. Most interesting, perhaps, is a figure in silhouette with human head, body and limbs, hands and feet, an enormous neck, and a caudal appendage like that of the apes, represented as walking on all fours. Delineations of animals include horses, single and in groups; reindeer, bisons, bears, elephants, and even a lion in bas-relief—an unusual subject in prehistoric art. Swans, ducks, nocturnal birds of prey, and other fliers are also represented. The explorations in the cavern which unearthed this art gallery of antiquity were conducted by a French count and his three sons during the brief furloughs of the latter, who were very active at the front and frequently cited in army dispatches.

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Coast-Guard Lifeboat Making for the Stricken Transport: At the Right the Hawser of the Breeches Buoy Is Visible. Although the Storm was Subsiding, the Camera Is Also Responsible for the Tame Appearance of the Sea

RESCUE STRANDED TROOPSHIP'S WOUNDED IN HEAVY STORM

By SEARLE HENDEE

BUT for a shifting wind, a tragic record of disaster probably would have been written on the first page of America's register for 1919.

It is doubtful if the annals of United States shipping contain an account of offshore rescue work that parallels that accomplished after the troop transport "Northern Pacific," picking its way to New York harbor through a dense fog and furious sea before dawn New Year's morning, grounded on the outer bar some 600 yards off Fire Island beach.

Aboard the palatial liner were some 2,500 homeward-bound soldiers, 1,734 of whom were wounded veterans of the Argonne. Of the latter, approximately 300 were stretcher cases, while a number of others were shell-shock patients. One gallant fellow, with neither legs nor arms, was aboard. All were removed without loss of a single life.

Since the days of square-rigged frigates, Fire Island in a storm has been the dread of mariners and the graveyard of ships. Its name is derived from the bonfires that in early years were built to warn seamen of its danger. The "Northern Pacific"

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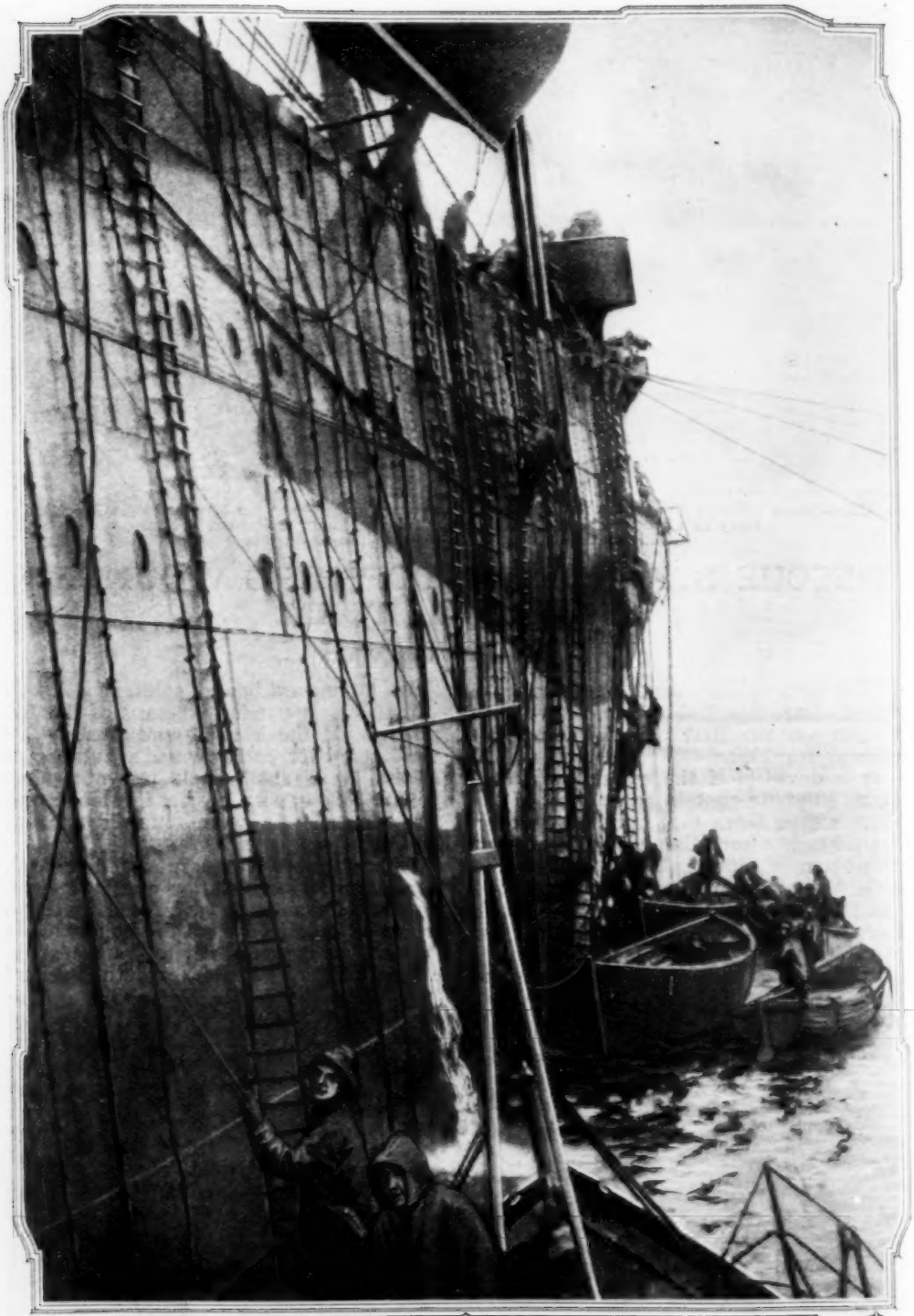
Bringing Wounded Ashore from the "Northern Pacific": Coast Guards are Shown Carrying Soldiers through the Surf onto the Beach. In the Background, Boats Guarding the Troopship are Silhouetted



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On the Third Day, Rope Ladders were Lowered over the Starboard Bow of the Stranded Ship to Enable Able-Bodied Soldiers to Reach the Rescue Craft Alongside. All but Some **200** of the Seriously Wounded Men were Removed before Nightfall. The Picture Above Shows Several Khaki-Clad Figures Descending the Ladders to Waiting Boats

More Than Three-Fifths of the Soldiers Aboard the Transport Were Wounded Veterans of the Argonne. This Made the Rescue Work More Than Ordinarily Difficult. The Picture Shows How Crippled Men were Lowered into Small Boats Standing alongside the Great Liner

On the Second Day Attempts were Made to Bring Some of the Soldiers Ashore. The Photograph was Taken at a Moment When Coast Guards Rushed into the Breakers to Save Wounded Men Who had been Thrown into the Frigid Water by the Capsizing of a Launch

went aground at a point opposite Lenelyville. Mountainous waves pounded it mercilessly, lifting and tossing it inshore a few yards at a time, and hammering it against the smooth, hard sand so that it shook and groaned, while furniture was bounced around dangerously. In response to wireless calls and distress rockets, coast guards and naval craft rushed to the scene, but the raging sea made them helpless.

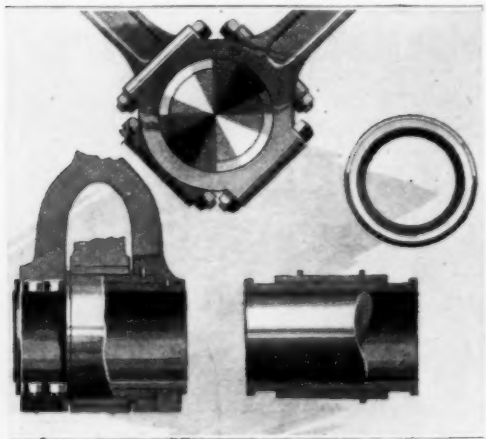
By noontime the ship had been driven more than 250 yards shoreward. The situation looked exceedingly serious. Two destroyers approached the troopship and fired lines across its bow. On the beach, where the coast guards had failed with the Lyle gun, men volunteered to attempt passing a line by boat to the ship. After a most heroic struggle in the breakers, they accomplished their seemingly impossible task. The rope was 300 yd. long, but the shore station had to be placed well out in the surf. It was then that the fates "lent a hand." The wind suddenly shifted and the stern of the "Northern Pacific" began slowly to swing around, bringing the ship parallel with the shore so that it rested on the bar instead of across it, and no longer was in danger of being broken in two. This stroke of good fortune made immediate use of the breeches buoy unnecessary, and no one was taken from the transport, which at the close of day was guarded by a fleet of a score or more craft, including cruisers, destroyers, and hospital ships, that stood by to render assistance in the event of emergency.

By the following morning the wind and sea had carried the ship 150 yd. farther shoreward—to within 150 yd. of dry ground. During the day 237 soldiers and 17 nurses were taken from the transport by breeches buoy, lifeboat, and trolley boat. After three boats, one of them a launch, had been capsized in the heavy breakers, and several wounded soldiers saved from drowning only by the heroic work of those ashore, operations were halted.

On Friday, the third day, the sea had subsided considerably, enabling 2,000 soldiers and nurses to be taken off the transport by light-draft submarine chasers and launches that worked between it and the vessels that stood by. Rope ladders were lowered over the starboard bow of the stranded ship and used by the able-bodied men in reaching rescue craft, which tossed alongside. The wounded were passed down in basket stretchers. The more seriously injured soldiers were left aboard until the next day, the fourth, when the rescue work was completed early in the afternoon and none but navy men remained aboard the ship.

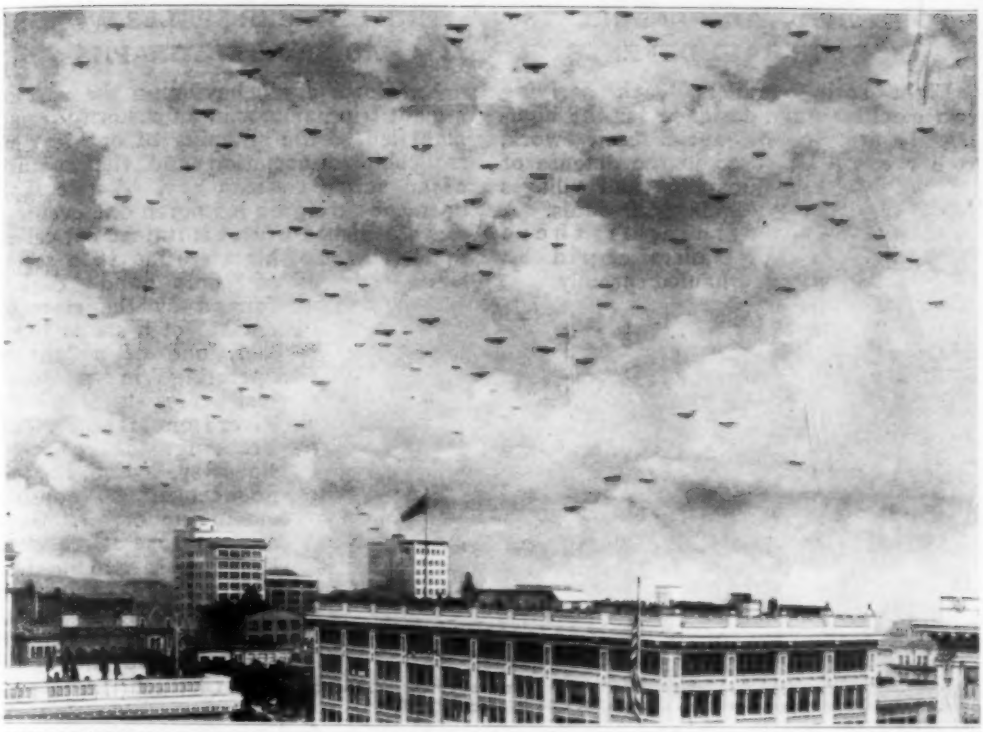
ADJUSTABLE CONNECTING-ROD BEARINGS FOR V-TYPE MOTOR

Simple bearings permitting independent adjustment, to compensate for wear, have been devised of late for connecting rods used in V-type motors. In engines of this character, the connecting rods are arranged in pairs, each of which usually consists of a forked and a single-end member used in combination. The customary bearing consists of a bronze-backed babbitt-lined sleeve clamped rigidly to the forked rod. It serves a dual function, for its outer surface forms the bearing for the single-end rod, which fits within the fork. The contention is held that this arrangement enables the adjustment of only the single-end rod, instead of both members, therefore involving replacement of sleeves to compensate for wear.



Top, Left, End View Showing Arrangement of Sleeves, and Part of Connecting Rods; Right, Cross Section of Bearings. Bottom, Left, Longitudinal View, Partly in Section, Showing Attachment of the Two Rods to the Sleeves; Right, the Two Sleeves Inclosing the Crank Pin

The new bearings aim to obviate difficulty by providing for the adjustment of either or both rods of an opposed pair. They consist of two split, concentric sleeves, separately clamped. The inner of these is considerably longer than the one that fits over it, and embraces the crankpin. It serves as the bearing for the forked rod, while the outer sleeve accommodates the other one, and is provided in the usual manner with a babbitt lining. Play between the inner, or



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Scores of Army Aeroplanes Skylarking above the Housetops of San Diego in Celebration of the Armistice: For More Than Two Hours 212 Machines Clouded the Air

forked-rod, bearing, and the crankpin, caused by wear, is taken up by the method usually employed in refitting the bearing of a single-end rod, that is, the edges of each half of the split sleeve are faced off. In readjusting the other rod, it is only necessary to face off the clamping cap of the outer sleeve.

LOW-TEMPERATURE PROCESS OF RUSTPROOFING STEEL

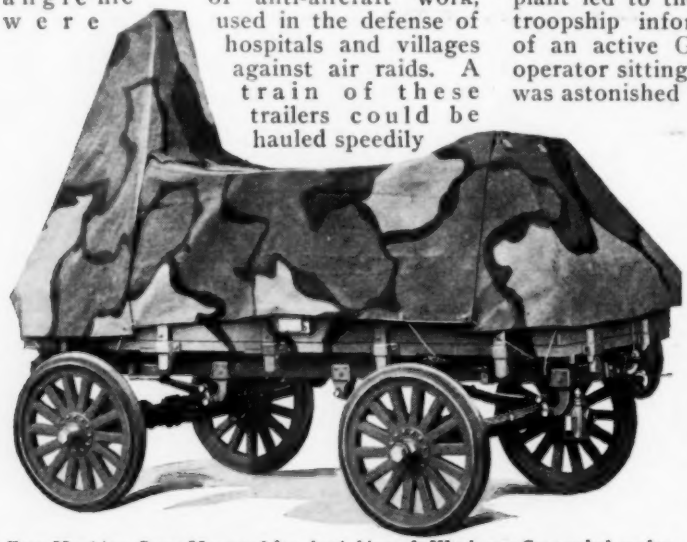
A low-temperature treatment of steel and iron in contact with zinc is being used commercially by a British concern to give tools and parts of machines a rustproof finish which is not injured by abrasion or denting due to usage. The parts to be treated are placed in a slowly revolving drum, where they are brought into contact with zinc powder. The temperature at which the drum is maintained causes the zinc to penetrate slightly into the iron, producing an outer coating of zinc, beneath which is a zinc and iron alloy. If continued usage bears out the claims of the concern employing this process, its adoption may become almost unlimited.

GREAT AERIAL PAGEANT STAGED ABOVE CALIFORNIA CITY

Never before has an American city been the scene of an aerial spectacle so extravagant as that which army fliers staged above San Diego, Calif., in celebration of the armistice last November. For more than two hours an armada of 212 aeroplanes maneuvered and flip-flopped in the sky while thousands of people in the streets and on the housetops craned their necks and watched the magnificent spectacle in open-mouthed wonder. Machines from three flying fields, Rockwell, Ream, and East, took part in the remarkable demonstration. Various types of craft, from fast-going scouts to the slower training planes and aerial ambulances, were represented. The new wireless telephone was used in directing the evolutions that constantly evoked exclamations from those who viewed them. It is reported that the machines covered a total of 34,000 miles in 424 flying hours, and returned to their respective fields without a single mishap. A striking feature of the show was a performance of aerial acrobatics by a picked team of five pilots.

PORTABLE WALL OF BULLETS FOR AIR-RAID DEFENSE

Light spring trailers, each carrying two machine guns designed for the high-angle fire of anti-aircraft work, were used in the defense of hospitals and villages against air raids. A train of these trailers could be hauled speedily to the best point of vantage when warning was received of coming enemy air craft. Each trailer carried a considerable amount of ammunition for its guns, the whole being made inconspicuous by a camouflage cover. A train of 10 trailers, each with its two machine guns firing continuously, made a formidable opposition to any air craft flying low enough for effective bombing.



Two Machine Guns Mounted for Anti-Aircraft Work are Concealed under the Camouflage Cover of This Light and Speedy Trailer

CAMOUFLAGE IN REVERSE FOR PEACE-TIME USE

Reversal of the camouflage principle, greatly increasing the visibility of its subjects instead of concealing them by blending them with the background, is declared a possible peace development by the naval officer who developed that particular nature-faking system. Since every positive has its negative, color applications opposite to those used for confusing the eye are being studied for a possible standardized system of making distant objects conspicuous.

¶Men who have served in the Tank Corps are moving for permanent organization in several communities. The "Tank Cats" of Chicago already is formed.

TRIP HAMMER SPELLS WORDS AS SPY TELEGRAPHS

Extraordinary behavior on the part of a giant trip hammer in an eastern forging plant led to the stopping of one leak of troopship information and the capture of an active German spy. A telegraph operator sitting on his porch one evening, was astonished when his trained ear called his attention to a series of dots and dashes formed by the staccato crashes of a steam hammer, one of a battery operating in a plant just across the Delaware River from his home. The Brobdingnagian clicks slowly spelled out the announcement, "Troopship moving tomorrow." Government operatives were summoned, and a few nights later deciphered another treasonable message in ponderous Morse code. While the agent who received the reports was not discovered, it was easy to find which one of the hammer operators had telegraph experience.

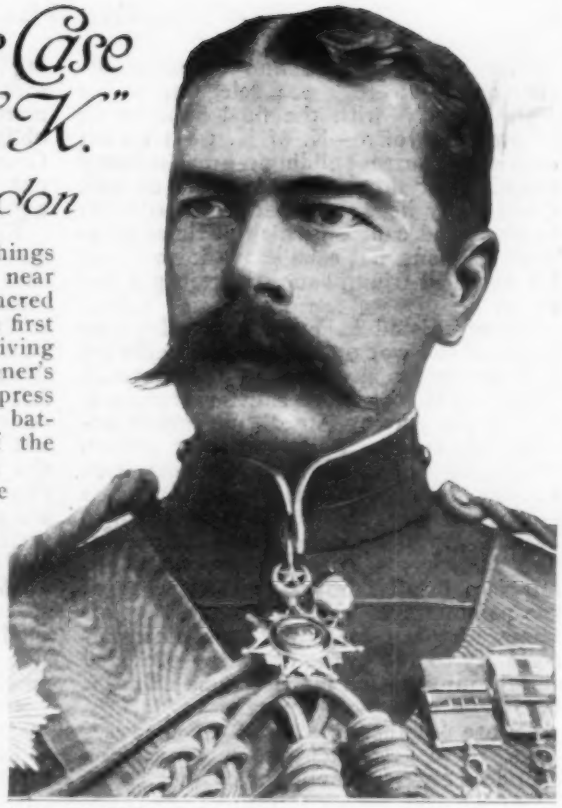
DIES MAKE FIFTY THOUSAND ROSE-HEAD RIVETS

The dies shown herewith were photographed after they had made 50,000 so-called rose-head rivets from ¾-in. wrought iron. This excellent record was possible on account of proper hardening and heat treating of the carbon steel used. The dies were used on a heading machine and formed 1,800 rivets per hour.

Dies Photographed After They had Formed 50,000 Rose-Head Rivets from Wrought Iron: They were Used on a Heading Machine

The Mysterious Case of "K. of K."

by E. T. Bronsdon



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HERBERT KITCHENER

First Earl of Khartoum, Viscount of Vaal and Aspall.

In Those Lazy Days before the Disillusionizing War, Declarations of England's Unpreparedness Failed to Disturb the Tranquillity of the Public. To the Popular Mind All Talk of Insecurity Was Folderol—for There Was Kitchener

ALONG the Nile River strange things were happening. On the shores near the last of the cataracts, a region sacred to camel travel since the time of the first Pharaoh, two lines of steel were driving toward Omdurman. It was Kitchener's railway, being constructed for the express purpose of transporting British battalions into the dread country of the Mahdi.

As engineers have testified, the handicaps of heat, native treachery, and lack of water made the work next to impossible. The iron will of Kitchener alone kept it from faltering.

Every man under "K. of K." had caught the spirit of success at any cost. It therefore was with fear and trembling that a young subaltern, in charge of a dynamite transport, sent in the following message: "Regret to report disastrous explosion. Nine men killed." Visions of court-martial and disgrace doubtless were in his mind.

Kitchener's reply was terse. "Do you want more dynamite?" he asked.

This story of Kitchener was told through the length and breadth of Great Britain at the time of his campaign in the Sudan. It is related here simply to show how the world looked upon this great soldier at the outbreak of the war with Germany. England herself was getting prosperous, fat, and lazy. All the faults that come with wealth and security were hers in some degree. When one of her statesmen would goad her with taunts, telling her how poorly she was prepared to cope with a powerful foe, common folk, in London, Edinburgh, Dublin, would shake their heads over the columns in the Times or News; then they would smile reassuringly at one another and say, "Oh, yes, but we have Kitchener!" By reason of dozens of authentic stories such as the above, and because also of the perfect record to his credit in Palestine, Egypt (commander of the khedive's army), Suakim (as governor-general), the Sudan, India and Africa, Great Britain looked upon him as at least a demigod—a man of sterling capability and will of annealed steel, to whom nothing in military accomplishment could be impossible. Britons attributed to him every quality they themselves lacked. He would "stand no nonsense." He was blunt. He sought no public adulation; just so the matter in hand was finished satisfactorily, was all he asked. In fact, he preferred some outlandish post—Zanzibar, Khartum, the province of the Red Sea—so he would have to attend no balls, banquets, or other social functions. He was efficient to a degree never reached before in the history of Britain's military.

The real chronicle of his successes and failures has been told. Of the former he had many; of the latter, a few. Suffice it to say that at the time Lord Haldane persuaded Sir Edward Grey to accept his resignation in favor of Kitchener as war minister, Britain drew a long breath of relief. During the long months that followed he trained the great army he was building, carefully and methodically. Though, eight months later, Lloyd George had taken over the new post as minister of munitions, Lord Derby had been placed

in charge of recruiting, and a greater portion of the strategy was delegated to Sir John French—with the final supervision of Marshal Joffre—K. of K. went on his own wise course, building a great military machine for three or more years of war. Continually he was at odds with opinion in press and cabinet, which at times menaced his plans, but each show-down found his iron will triumphant. Britain got her army.

There existed in England at the outbreak of the war one of the most efficient and dangerous spy systems in the world. This was all the more sinister because it was in the employ—in all but certain exceptional cases—of no particular nation. It consisted of a coterie of extremely rich international Jews. These men and women—for there were three or four women who became especially obnoxious—had extensive investments in bonds, stocks, and enterprises in all countries. The swing of the pendulum in politics and military affairs gave these creatures opportunity incessantly to add to their wealth—provided certain information reached them before it became known in the markets.

Before Kitchener arrived to keep secrets, these Jews kept up a continuous round of entertainment for cabinet members. Though no accusation of treachery ever has been brought against one of the latter, it is certain that the Jews got what they went after. With the aid of lavish hospitality, they simply managed to deduce knowledge that meant millions monthly to them. A cabinet minister might have the matter of the sale of certain properties mentioned in his presence. At another time he might be asked indirectly whether he thought—as an individual, of course—whether a week or a month would see a great rise in the value of the properties. This was equivalent to asking whether he knew of any government action that would bear directly on the matter. As a man he gave his idea concerning the possible rise, perhaps vaguely, perhaps with no explanation whatever. The Jews, however, knowing their guests as gentlemen, knew the whole situation immediately, and acted accordingly.

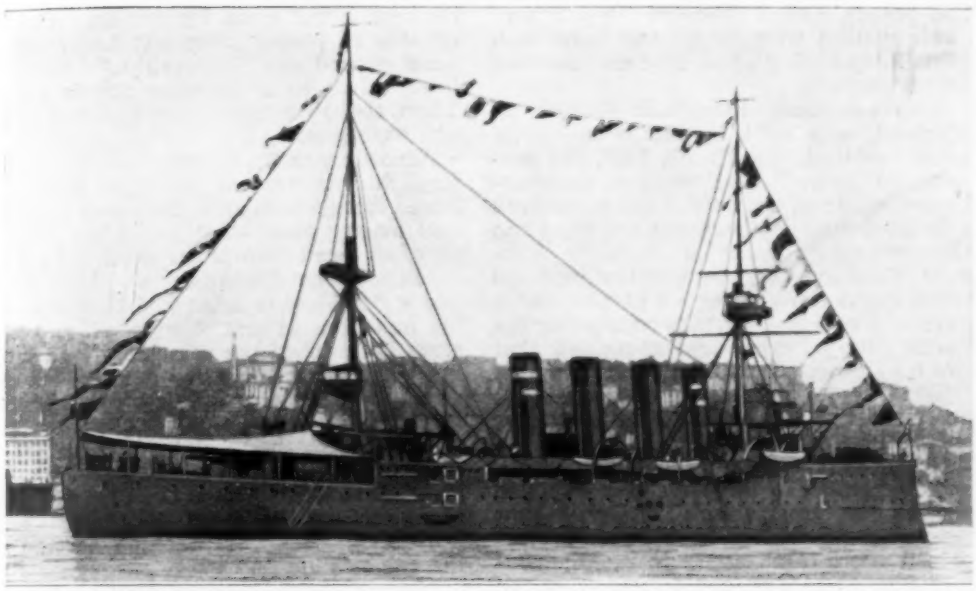
Though this sort of thing was not exactly just to Englishmen themselves, it would not have been so bad had not Germans kept close watch of the Jews. Knowing them to have the inside track with many men "in on the know," the Huns found themselves able to keep an accurate check on the progress of affairs in the chief enemy camp simply by watching the Jews making their transactions, and figuring the reasons behind. In addition to those Jews who had no other motives than mere money making, some few, feeling no obligation of country or race, helped the Germans directly. These were stamped out gradually, but the evil they did was a great handicap at first.

Kitchener took one dinner—at a London café—with a prominent member of this international coterie. During the meal he discussed nothing but the superstitions of the country (Ireland) in which he had spent his boyhood. At the end of the meal he refused to allow the bill to be left on the account of the Jew, who, of course, had unlimited credit at the place, but asked and paid for his own score. All the rest of the time he was in office he disregarded or refused all snares put in his path by these people, thereby earning their most cordial enmity. It was useless for them to pester him; he turned his gruffest mien. During the one year and seven months that followed, the Jews made far less money, for Kitchener kept not only his own secrets, but saw to it that the other cabinet members knew no more than the press told concerning vital matters.

This would not be of importance except for what followed. On a certain spring day in 1916—the Germans claim the date to have been June 5th, and the British Admiralty so far has been silent on the subject—the transport "Hampshire" left Queenstown for Archangel. Whatever the date, or whatever the accident that happened—the British naval report said that the "Hampshire" struck a floating mine, while the Germans stated definitely that the submarine "U-29," later accounted for by the allies, sank the vessel—the "Hampshire" never reached port. K. of K. had been on board.

The week following the receipt of this news was one of mourning, horror, and uncertainty in Great Britain. Over one hundred vessels scoured the sea in the path supposed to have been taken by the "Hampshire," but not even a single body or a piece of wreckage was recovered. The nation grieved; its greatest national hero certainly since "Chinese" Gordon, and probably since Nelson, had been snatched away without warning and without explanation.

Certainty concerning his death never was reached, at least as far as the man on the street was concerned. Only a few days after the sad news, came a whisper that the Jews had furnished news of his going, to the Germans, who had lain in wait for the "Hampshire" and captured it.



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It Was aboard the "Hampshire" That Lord Kitchener Left Queenstown. The Vessel, Here Shown, Was an Armored Cruiser of the "Devonshire" Class, and was Completed in 1905. It Was 450 Feet Long and of 10,850 Tons

Another of the rumors said that Kitchener had reached an impassé with the cabinet, and that rather than have his hands tied, he had retired to Khartum incognito—"or to one of those places, you know." Because this is precisely what Kitchener might well have done if the pacifists and the "no-expeditionary-force-to-France" agitators had carried public opinion with them, the idea gained much credence for a time. The English press, however, quietly communicated with its correspondents in all parts of the empire, discovering by the process of elimination that, if Kitchener had gone into private life, he had deserted all of the haunts that had known him earlier—something practically impossible for a man of strong likes and dislikes, such as he.

Then came a startling development. A woman by the name of Biddy Cullogh came forward with the statement that she had seen and spoken with Lord Kitchener. He had confided in her that his work in the present war was done, but that if England's necessity ever demanded, he would come back to help.

Immediately the British Isles were in a furore. One diligent reporter discovered that Biddy Cullogh was an old hag who lived in Ballylongford, near the head of the Bay of Taplee, Kerry, Ireland, and that she was known about the country there as a witch. Her chief claim to fame previous to her "interview" with the supposed dead man had been the fact that, 37 years previously, she had told the fortunes of Lieut. Col. H. H. Kitchener—Lord Kitchener's father—and of his three sons. The prophecy, uncovered in the father's scrapbook, was sheer drivel so far as all but Herbert was concerned. He would "conquer many lands, but at last come to the sea after years of wandering," she had said of him. This career was not so difficult to guess, in spite of all the importance attached to Biddy Cullogh's foresight, since at that time Lord Kitchener had been a student at Woolwich. The touch concerning the sea might have been entirely fanciful, and borne out by mere coincidence.

The British saw to it that she was pinned down to her statements, however, and the upshot of it all was that she admitted, under some pressure, that she had seen Lord Kitchener in a dream, and not in the flesh. The only permanent effect she had created was one of doubt in the minds of most people, who put her down, with probable exactness, as something of a faker. A few there were, however, who professed to see the dark hand of "influence" behind her change of stand. They claimed that the authorities, who were only too well satisfied with Kitchener's sudden retirement, had brought pressure to bear on the old woman, and persuaded her to give herself the lie. The story, in the final version that appeared in the Eng-

lish papers, rather ridiculed the props of "hair matted with kelp," and what not, that Biddy Cullogh had used to make her dream realistic.

This sensation, though it thrilled all England, was mild in comparison with what followed. In March, 1917, the parents of Charles T. Latham, a noncommissioned officer in the British army, received a letter from their son, penned from the German prison camp at Jadoigne, Brabant, Belgium. The note, in line with the strict regulations enforced at the camp, gave only optimistic details concerning the young man's health, and requested that several articles of clothing be sent to him.

The parents had known of his passage on the ill-fated "Hampshire," and so had given him up for lost months before. In their joy they told the news far and wide, and it spread like wildfire. "My boy also was on the 'Hampshire'!" "They've got Kitchener a prisoner in Germany!" was passed along from mouth to mouth. Before even the papers could investigate the story and print it, a fair proportion of the people in England were positive that somehow or other the Germans had managed to sneak into the fourth dimension, and had taken the "Hampshire" past the British navy and into Wilhelmshafen.

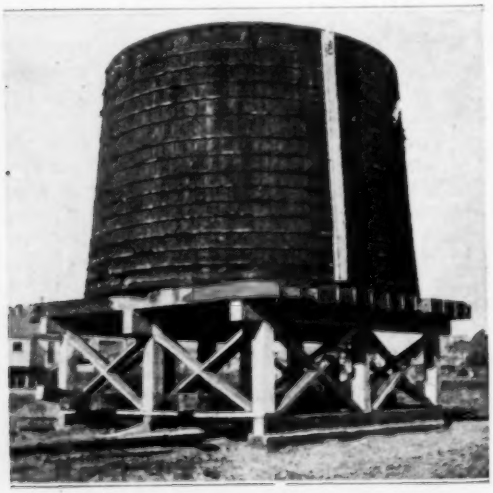
This was the last great rumor. Unlike the rest, it had some foundation that was capable of proof. Sergeant Latham had been aboard the "Hampshire." He had been taken to a German prison camp. There the truth came to an end, and speculation began.

According to the terms of the armistice, English prisoners at Jadoigne were released some weeks ago. Sergeant Latham was among them—but not Lord Kitchener, or even one other soul who had sailed on the "Hampshire." His story added but little to what had been known. He had been asleep. Two terrific explosions had racked the vessel, and she sank in a few minutes. He had been picked up, after a half hour of holding to a life preserver, by a German U-boat. They had taken him, he thought, mainly as a proof of the "Hampshire's" sinking, which they claimed to have accomplished. He had seen nothing of Lord Kitchener, and heard nothing all of the time he was in the enemy's hands.

There ends the story of Herbert Kitchener, first Earl of Khartoum, Viscount of Vaal and Aspall. Because it cannot conclude with authenticated records of the last action and last words of this greatest of professional soldiers, to many of his admirers and foes it may always remain shrouded in mystery.

BIG TANK FOR IRRIGATING FIELDS IS PORTABLE

A novel accessory to an irrigation system in Alameda, Calif., is a 40,000-gal. water tank which is moved a considerable distance back and forth on rollers between two tracts, as the need arises. The tank serves as a reservoir from which pipes laid in the fields are supplied with water under pressure, in order that it may be discharged through sprays instead of in the ordinary fashion.

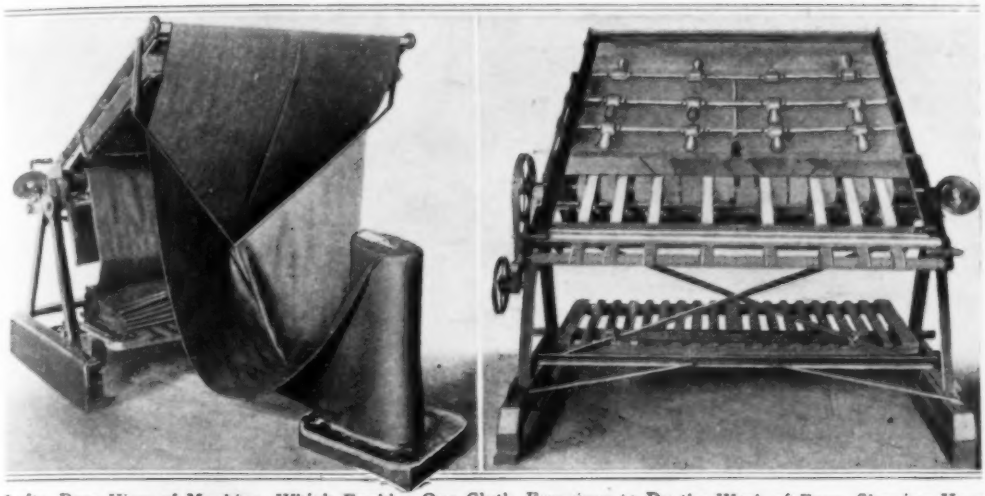


This 40,000-Gallon Water Tank is Moved between Two Tracts to Serve as a Pressure Reservoir, the Water from Which is Discharged through Sprays

COUNTY-OWNED MACHINERY AIDS LOCAL FARMERS

A limestone crusher purchased by the county agent of Allen County, Ky., does work for the local farmers at cost during eight months of the year, being used on county road work the other four months. A demonstration of the remarkable fertilizing value of limestone dust on red-clover fields so impressed the fiscal court of the county that the unusual purchase order followed.

¶ Positive electrodes for flaming-arc lamps with their chemical mixtures applied on the outside, and arc-lamp carbons with metal sheaths are late European developments.



Left: Rear View of Machine, Which Enables One Cloth Examiner to Do the Work of Four, Showing How the Cloth is Unrolled, Spread Out Its Full Width, and Later Laid in Folds. Right: Front View of the Machine. The Lights Shown Are beneath the Plate-Glass Top of the Inclined Board

NEW MACHINE LESSENS WORK OF CLOTH EXAMINERS

A machine doing the work of four men has been built, which unrolls suiting for inspection, measures it, and refolds it—a task heretofore done wholly or in part by hand. The bolt is unrolled standing on end on a pivot, and the cloth is spread out full width, after which it is drawn over a tilted inspection board having a plate-glass top. It is then piled in folds of the proper width, ready for sponging and shrinking. Beneath the glass top are several electric lights which make it easy to detect flaws in the cloth as it moves along. Levers at either side enable the inspector to stop and start the machine at will, while a yardstick at the base of the board shows the width of the goods at all times.

OIL-WELL FLOW INCREASED BY ELECTRIC HEAT

An electrical method of carrying warmth to the bottom of oil wells has been found in many cases greatly to increase the flow of oil. The heating process decreases the viscidity of the oil, usually occasioned by the admission of air to the well and the cooling of the rock bed. Minute crevices and capillary channels which afford easy passage to warm, thin oil become quite impassable if the oil gums. The electric heating method not only thins the oil but often generates gas whose pressure helps the oil to the surface. The system found military use in the abandoned oil fields of Roumania and Galicia.

FILMS OF FISH CATCHING TO INTEREST PUBLIC

Motion pictures which take their observers to the fishing grounds of the swordfish and mackerel catchers are calculated to increase the interest and knowledge of the public on the subject of fish. Two reels of film, showing seining and harpooning operations, are arranged for school and club use.

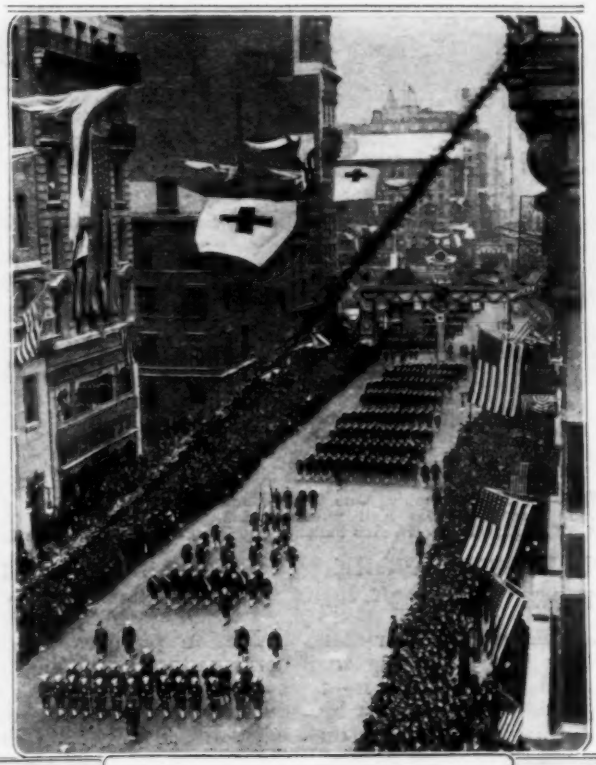
TELEPHONE POLE SUSPENDED FROM CONTRACTED WIRES

On a telephone line in the Southwest is to be found a striking example of contraction of copper wires due to cold. One of the poles, situated in the bottom of a gully, has rotted through at its base and in cold weather hangs in mid-air with its lower end 3 ft. above the ground. The poles either side are on somewhat higher ground. Evidently the wires were strung in hot weather and pulled rather tight, the contraction of the copper strands accounting for the unusual sight.

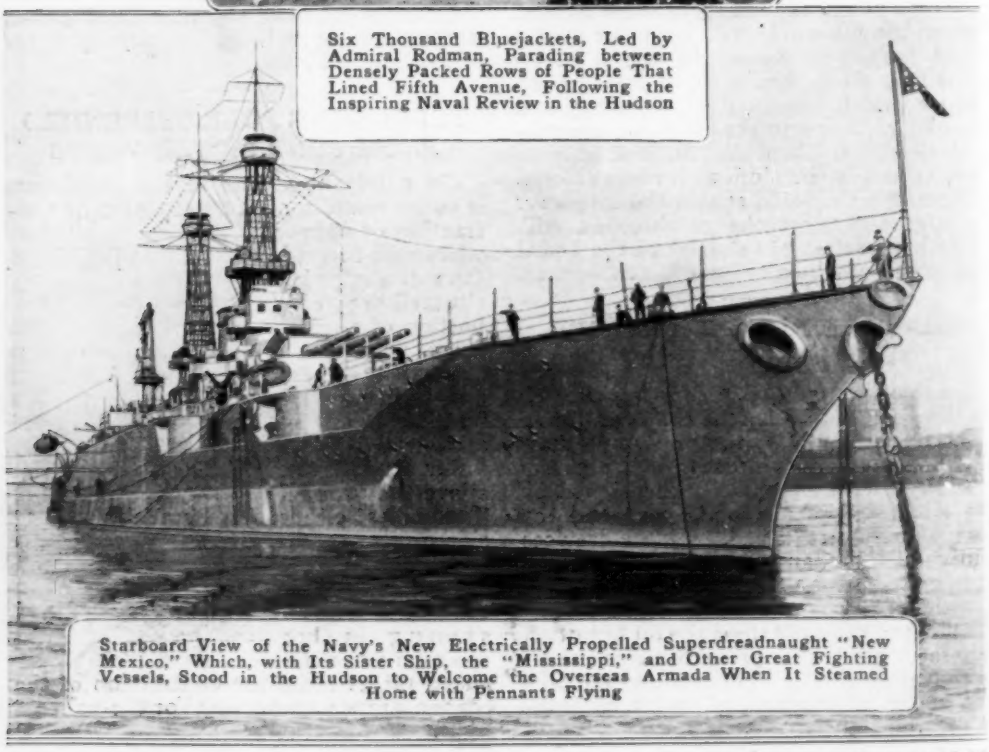
RETURNING OVERSEAS FLEET GIVEN OVATION

ENTHUSIastic welcome was accorded America's overseas armada on the occasion of its home-coming during the Yuletide. The whole-hearted feeling of the nation was expressed in a signal ovation given the returning sea fighters by hundreds of thousands of New Yorkers who crowded both banks of the Hudson to witness the review, and later packed Fifth Avenue as it never had been packed before, to cheer some six thousand marching bluejackets, led by Admiral Rodman.

Snow and haze marred somewhat a naval spectacle of uncommon inspiration, when 10 gray-sided dreadnaughts steamed past the Statue of Liberty, the "Mayflower," with Secretary Daniels and his party aboard, and the "Aztec," which bore Assistant Secretary Roosevelt, to their anchorages. Nine of the great float-



Six Thousand Bluejackets, Led by Admiral Rodman, Parading between Densely Packed Rows of People That Lined Fifth Avenue, Following the Inspiring Naval Review in the Hudson



Starboard View of the Navy's New Electrically Propelled Superdreadnaught "New Mexico," Which, with Its Sister Ship, the "Mississippi," and Other Great Fighting Vessels, Stood in the Hudson to Welcome the Overseas Armada When It Steamed Home with Pennants Flying

PHOTOS COPYRIGHT, UNDERWOOD & UNDERWOOD

Led by the "Arizona," the Ten Gray Dreadnaughts Steamed into the Hudson on Time to the Minute and Aflutter with Flags of Every Color. In the Procession Were the Flagships "Pennsylvania" with Admiral Mayo, "New York" with Admiral Rodman, and "Utah" with Admiral Rodgers

Secretary Daniels and His Party, Including the Widow of the Late Admiral George Dewey, Reviewed the Home-Coming Fleet from the Presidential Yacht "Mayflower," above Which Hovered an Observation Balloon. The Air was Filled with the Roar of Guns, for Each Ship Saluted as It Passed

ing forts,. flying from their aftermasts long, homeward-bound pennants that trailed far astern, were fresh from active service in British waters where part of their number coöperated with the Grand Fleet, and others operated from a base in Bantry Bay. The tenth vessel was the "Pennsylvania," flagship of Admiral Mayo, commander of the Atlantic fleet, returning from Europe after escorting President Wilson to France.

As the ships, aflutter with flags and headed by the "Arizona," filed past the "Mayflower," they saluted the Secretary of the Navy. When they reached their anchorages, the Hudson harbored one of the greatest assemblages of American fighting ships ever congregated, for there also rode at anchor the fleet of Vice Admiral Grant that had stood guard in home waters. Among the latter were the "New Mexico" and its sister ship, the "Mississippi," the navy's new electrically propelled super-dreadnaughts which recognize no peers, either in home or foreign waters.

At the conclusion of the review of the fleet under way, the "Mayflower" circled the ships, and Secretary Daniels reviewed them at anchor. Instead of salutes being fired a second time, the national anthem was played as the presidential yacht passed each of the vessels.

BIG STEAM TRACTOR OPERATES PUMPS AT CITY WATERWORKS

After the power plant of the Pierre, S. D., waterworks was destroyed by fire early in June, last year, a large steam tractor was assigned the task of operating the pumps. The latter force water through a 10-in. main, against a 290-ft. head, to a reservoir nearly two miles distant. The tractor had seen three reasonably busy years of service before being put to the test of supplying citizens of Pierre with water by working 24 hours a day, seven days of the week. In a short time it demonstrated its capacity to the city authorities and was purchased for a sum amounting to only $300 less than its original market price. Recent advices indicate that the tractor is still in continuous service and giving a satisfactory account of itself.

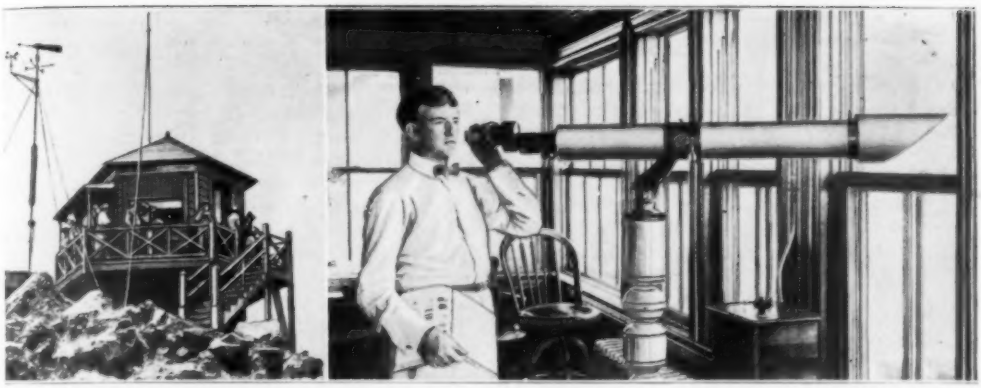
BOTTLED HEALTH PASSPORT GUARDS AMERICAN SEAMEN

Little glass bottles now carried in the pockets of American sailors contain printed forms which, properly filled out by a ship captain, serve as "passports to health." They admit their bearers, if ill, to United States marine hospitals and insure the best free medical care everywhere.

OBSERVERS REPORT APPROACH OF ALL MERCHANT VESSELS

The entrance of all merchant vessels into certain bodies of water, such as Puget Sound, the Columbia River, and Chesapeake Bay, is noted by an official observer of the United States Weather Bureau. Communicating with each craft by signals, he learns its name, the name of its captain, its destination, and the character

This Big Tractor, Working Steadily 24 Hours a Day, Pumps Water through a 10-Inch Main to a Reservoir Nearly Two Miles Distant, at an Elevation of 290 Feet



Left: The Vessel-Reporting Station at the Top of Mount Tamalpais, to the North of the Golden Gate, California. Right: The Observer at Cape Henry, Virginia, Who Reports All Vessels Bound for Norfolk, Newport News, Baltimore, and Other Points on Chesapeake Bay

of its cargo. This information is at once telephoned or telegraphed to the proper authorities so that dock berths can be made ready and facilities provided for unloading. Often it is possible to have freight cars spotted in advance to receive a perishable cargo.

ITALY COINS NEW THALER IN ANTIQUE PRESS

For esthetic reasons the Italian government is using the old weighted-lever press for coining the new thaler, designed to supplant the Austrian thaler for circulation in East Africa and along the Red Sea. The old press exerts its pressure only on the two faces of the silver disk, entirely neglecting the edge. As a result the finished coin has a free margin and its contour is not exactly round. Handling the old press requires a higher degree of technical skill than operating a modern coin press. The revival of this ancient method, long in disuse, was demanded by the free design of the new coin, its purpose being to displace its foreign-born predecessor without encountering popular resistance to change.

¶United States mints worked 24 hours a day during 1918 to meet the demand for silver half dollars, quarters, and dimes, of which coinage $35,000,000 was produced.

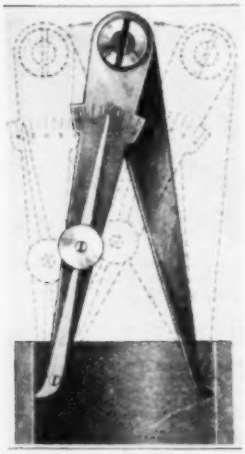
EUROPEAN COMMUNAL FORESTS HELP PAY CITY TAXES

A source of revenue which many European cities enjoy, but one which is unknown to American municipalities, is the communal forests, some of which pay a generous part of the towns' annual tax bills. Probably the European record has been set by a Swiss town of 16,000 people which makes $66,000 a year from a relatively small piece of timberland. Some of the French municipalities are close rivals. The forests being near the market, the communities are able to sell not only the logs for lumber, but the small branches for firewood, and the leaves and twigs for animal bedding. During the war, Canadian and American forestry battalions were stationed in many of these forests, preparing lumber for army uses.

Logs Taken from a Communal Forest in the Jura Mountains, in France, Which Is an Important Source of Revenue for the Municipality Controlling It

INDICATING GAUGE OF NEW DESIGN

A new indicating gauge, somewhat resembling an ordinary caliper but having special features requiring that it be used a little differently, has been placed on the market. The tip of one of the legs of the instrument consists of a pivoted lever connected with an indicator attached to the side of the leg. The latter shows small fractions of an inch much magnified. After adjusting the gauge by means of a micrometer, it is placed inside or outside the object in work, and any variation from the size desired will be shown by the changed position of the indicator hand.



FLAG FOR EX-SOLDIER EMPLOYES

A new sort of a service flag—one telling how many returned soldiers are employed in the establishment displaying it—has been hung up in a Seattle office. The banner has a blue field with a white border, and in its center is a large six-pointed white star. On the latter are small blue stars surrounding a large blue numeral, indicating their number. This numeral, together with the legend "Returned Soldiers Employed Here," explains the meaning of the flag.

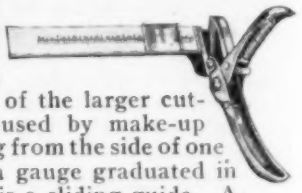
¶Warnings of forest-fire danger resulting from weather conditions have been extended by the United States Weather Bureau to include protection to crops and stocks in districts of special fire hazard.

FILMS FOR NEW CITIZENS SHOW OPPORTUNITIES

When the United States Bureau of Naturalization has exhibited to its alien guests a movie record of America's national and industrial history, it will proceed under its new plan to present to them a still more interesting series of films. The pictured story of a naturalized citizen's success with a fruit farm, in all its stages from the acquisition of the land to the completion of a home for the family, will be followed by studies of certain trades, revealing to the new American his possibilities of usefulness in productive labor. The shoemaking trade, to mention one example, will be detailed on the screen from "close-ups" of the machinery to the finished product. These films, accompanied by the running comment of a teacher, will soon acquaint the stranger within our gates with the fundamentals of American industry.

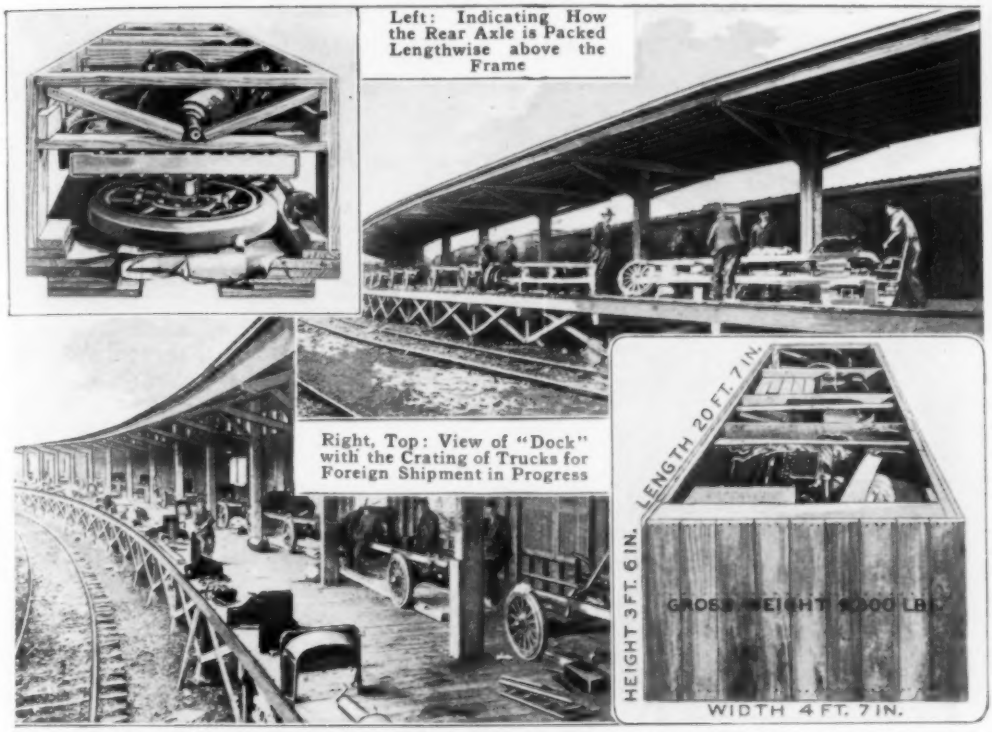
NEW LEAD AND SLUG CUTTER A SMALL HAND TOOL

A convenient timesaving tool for use in composing rooms is a lead and slug cutter not much larger than a pair of pliers, which takes the place of the larger cutter commonly used by make-up men. Projecting from the side of one of the jaws is a gauge graduated in ems, on which is a sliding guide. A compound lever system actuates the blades so that the tool is easy to operate.



AIR-FILTERING MACHINE MADE WHOLLY OF IRON

An air filter containing nothing but iron is one development of Germany's shortage of wool, which material was formerly used to filter the air for cooling electric machinery and for operating compressors. The new filter cleans the air by conducting it through devious channels whose surface is large in proportion to their section. Particles of foreign matter are thus removed both by friction and by the baffleplate action of the sudden turns. The process is entirely a dry one, and therefore not of the type which substitutes washing for filtering. The device is reported to offer little resistance or back pressure.


Left: Indicating How the Rear Axle is Packed Lengthwise above the Frame
Right, Top: View of "Dock" with the Crating of Trucks for Foreign Shipment in Progress
LENGTH 20 FT. 7 IN.
HEIGHT 3 FT. 6 IN.
WIDTH 4 FT. 7 IN.

Trucks are being Disassembled on the Platform Above, Preparatory for Packing. The Box Illustrated at the Right Contains All the Parts of a Three-Ton Truck and Is Ready to be Covered

SAVE TIME, LABOR, AND SPACE IN CRATING TRUCKS

One of the well-known motor-truck companies has materially reduced labor and conserved shipping space by inaugurating a new method of crating machines for consignments overseas. In the past the disassembling and boxing of a truck has kept a dozen men busy 12 hours. The work is now accomplished by four men in four hours. Furthermore, the size of the packing case has been reduced about 16 cu. ft., obviously an item of importance in view of the prevailing shortage of bottoms.

The savings in time, labor, and shipping space have been effected by abandoning progressive disassemblage and also by demounting the front and rear axles, instead of leaving them in place. The merits of progressive assembling are patent. Progressive disassemblage, however, is quite another thing, for it scatters parts and makes necessary their subsequent collection and transfer to the last station, where the crating is done. On the other hand, by removing the axles and placing them longitudinally, it is possible to reduce the width of the packing crate approximately a fourth. This arrangement in turn makes it possible to pack all the wheels beneath the frame, instead of above it, and thereby reduce the height of the crate. These simple changes have enabled the various parts to be made fast, adjacent to their respective normal positions, in a box that is only two inches higher than the top of the motor, which of course, with the transmission set, remains bolted to the frame.

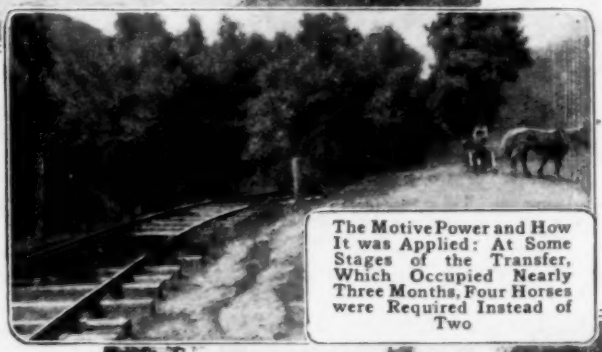
In accordance with the present system, a car billed for foreign shipment is run astride the bottom of its crate on the packing dock after the road tests have been completed. Four men, trained especially for the work, disassemble it in reverse order to its original progressive assembling. This means, for instance, that the radiator core is removed first, instead of last, and other members are demounted accordingly. Throughout the procedure, the truck remains in position over the floor of its packing crate, which, incidentally, may later be used as the body platform. Also there are enough 20-ft. hardwood boards used in the crating to serve as material for the sides of a finished body.

RESCUING A MAROONED TRAIN WITH CAPSTAN AND CABLE

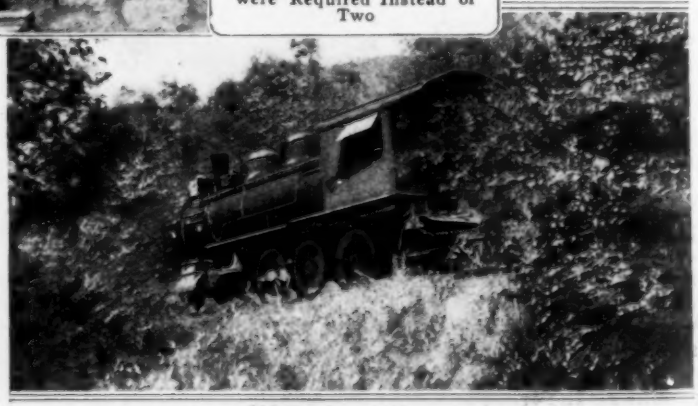
By J. E. MURPHY

USING a house-mover's outfit for hauling a train weighing more than 400 tons, over grades and curves that it would have been impossible for a locomotive to operate on, was the unusual feat in railroading recently performed on a branch line of the Santa Fe in California. The scene of this undertaking was Temecula Cañon, where the railway running from Oceanside, on the Pacific, to the inland town of Fallbrook formerly terminated. In midwinter, the line in the cañon was washed out—washed so clean that in most places it was impossible to find a trace of the track or roadbed. A complete train, consisting of an 80-ton engine, two passenger coaches, four refrigerator cars, and four freight cars, one of which was a flat car loaded with a 36-ton turntable, was left stranded in the cañon. Obviously, with rolling stock at a premium, the railroad company could ill afford to abandon this isolated train. Since the cañon was subject to destructive floods and had given a great deal of trouble in the past, the railway officials decided to abandon this route and build through another cañon to Fallbrook. The real problem of this scheme was the rescue of the marooned train, which was valued at about $50,000. The only way to get the train to the new terminus was by a crooked route leading over the ridge that separates the two cañons, and this was a thing that could not be done by any ordinary railroading methods. The total distance was 8,300 ft., or slightly more than a mile and a half, and it was necessary to lift the train, in a distance of only 4,300 ft., to a height of 440 ft. above the bottom of the cañon. As a possible solution of the difficulty, a house moving contractor, long experienced in the heaviest class of work, was called in and told to bring the train "home"—if he could. A temporary track was built, and in this track excessive grades and curvature were both unavoidable. The steepest grade was 14 per cent, or 739 ft. to the mile, while the average was more than half this. At one point, the track was built on a curve having a

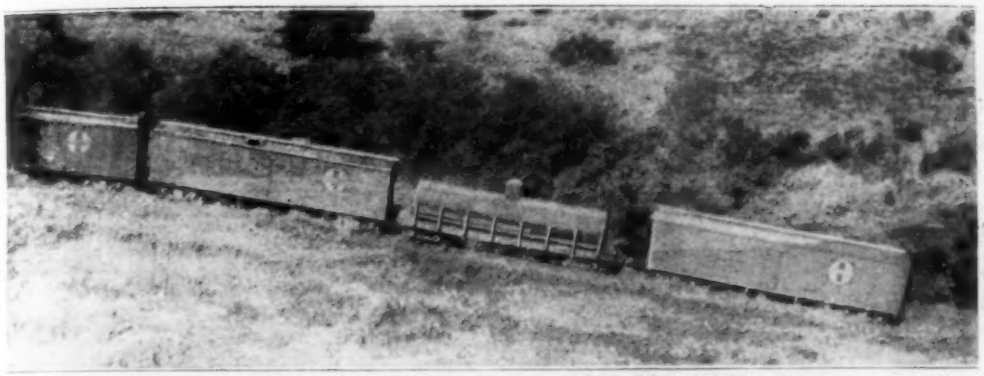
On a Sharp Curve near the Summit of the Ridge That Separates the Two Cañons



The Motive Power and How It was Applied: At Some Stages of the Transfer, Which Occupied Nearly Three Months, Four Horses were Required Instead of Two



Pulling the Engine Backward: The Removal of the Small Wheels Shortened the Wheel Base So That Curves could be Negotiated



The Steepest Section of the Grade, the Incline at This Point Being at the Rate of 739 Feet to the Mile: Here Four Horses were Required to Work the Capstan

radius of only 144 ft. Extreme care was necessary to avoid the danger of losing the train down the side of the cañon. The house-mover's capstan used on the job had a 10-in. spool and an arm with a 9-ft. sweep. The general plan adopted for handling the work was to pull the entire train forward a short distance in "cuts" of one or two cars, repeating this process until the work was finished. By using a ½-in. steel cable and six single-sheave blocks, the 80-ton engine was easily pulled up the 14-per-cent grade by four horses. On the lighter grades two cars were taken at one pull, usually by two horses, while on grades that were less than 10 per cent two horses were easily able to handle 50-ton loads. Ties were wired behind each pair of car wheels, and 12 by 12-in. chocks behind each pair of engine drivers, these being dragged loosely on the rails so that they would block any backward movement. The cars and engine were chained to the track when not in motion, and the added precaution was taken of removing the track behind the engine, which had been switched to the lower end of the train before the work started. The engine furnished the only real difficulty in connection with the excessive curvature, and to reduce this difficulty as much as possible the tender was removed and the engine was stripped down to a 15-ft. wheel base. Even with this precaution it was necessary to keep the inside rail on the sharpest curves well greased with crude oil and to elevate the outer rail 4 in. above the inner rail.

The Framework of the Railroad Turntable Which Occupied a Flat Car in the Train: It is Here being Drawn Up a Steep Grade

Pulling the Engine Uphill Backward: Note the Chocks behind the Drivers to Prevent a Runaway in Case the Chains or Cables should Break

This piece of salvaging work, which is probably unique in the history of railroading, was completed without mishap of any kind in a little less than three months. The cost of the operation was but a fraction of the value of the rolling stock which was rescued.

LANTERN, LENS, AND SLIDES PACK IN SMALL CASE

A case, which forms in itself the frame for a stereopticon with its lamp house

This Carrying Case Has a Lens Telescoped into One End and a Ventilator on Top, and When Set Up Becomes a Complete Stereopticon with 75 Slides

and lenses, furthermore finds room for 75 standard slides in a space 17 by 11 by 6 in. The ventilator top and objective lens telescope into the case, which then somewhat resembles a large box camera, the outfit weighing but 12 lb. The lantern, connected by its cord and plug to any electric-light socket, may be used for projecting pictures on a screen, 10 ft. square or smaller.

¶Arc-lamp carbons are mechanically covered with a thin coat of metal, which is then thickened by electroplating in a new European process.

TRAVEL TO NATIONAL PARKS MAY BREAK ALL RECORDS

In spite of war restrictions on travel, the number of visitors to the national parks in 1918 was 454,891, or about 90 per cent of the number of the previous year, according to a recent government report. In view of the fact that fighting has ceased and many new park privileges will be offered the public, more visitors than ever before are expected this year. The total appropriation for these national playgrounds for the year beginning June 30, 1918, was $1,012,000, while the revenue for the previous year was approximately $217,000. With the return of peace, it is hoped by patrons of outdoor recreation centers that congress will take favorable action on the proposal to make the Grand Cañon, Mammoth Cave, the Indiana sand dunes, and the big-tree areas, national parks.

"CENTIPEDE RACE" RIVALS OLD TUG OF WAR

Athletically inclined men and boys who formerly chose sides and proceeded to gratify their competitive spirit by a vigorous tug of war have discovered a new and rival form of group sport. The "centipede race" is a frequent event on the athletic field of a large rubber-manufacturing plant, whose executives encourage manly sports of all kinds. The "centipede" is formed by 12 or 15 men who straddle a long pole and run down the field. Rival "centipedes" so made up are able to put forth efforts which, under the spur of competition, become quite exciting and well worth watching.

A "Centipede Race": A Long Pole and 12 to 15 Men Constitute a "Centipede," and Two of Them in Competition Make Quite a Spectacle

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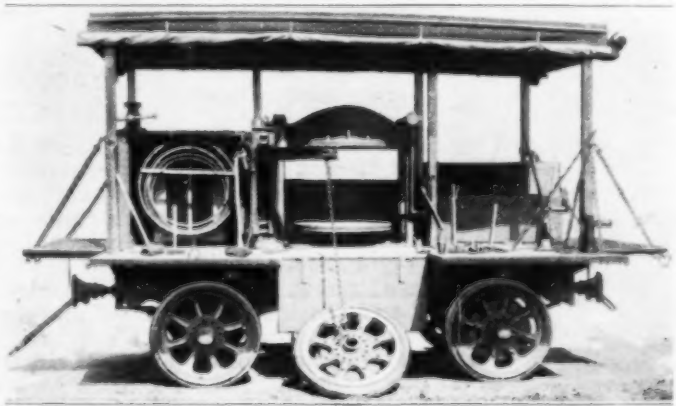
AN UNUSUAL VIEW OF AMERICA'S WELCOMING HAND

VIEWED from a different angle, this is the most welcome sight in the world to the millions of men who are beginning to trickle back home, in groups of hundreds or thousands, from the Old World to the New. The picture, because of its airy viewpoint, reveals some things not ordinarily observed in such perspective by the returning wanderer. Particularly clear is the 12-pointed star form of the base of France's generous gift to America, which holds its electric torch of liberty 300 ft. above the level of Bedloe's Island. The peculiar contour of the island itself is a feature not grasped at the normal altitude of vision, presenting an entirely new conception of our most familiar landmark.

ARMY AUTO TRAILER EQUIPPED AS TIRE-REPAIR SHOP

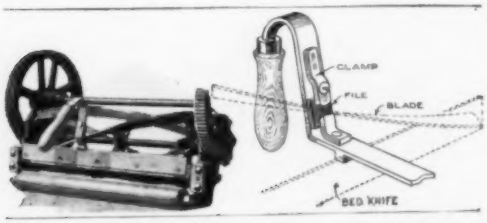
An important adjunct of the motor service of the United States Army consists of motor-truck trailers especially equipped to serve as complete tire-repair shops. A number of these outfits were shipped to France for service along lanes of travel leading to the front. That their use would eliminate costly delays in making repairs while the armies were moving forward rapidly, is obvious. Each conveyance is 13 ft. long and of five tons' capacity, and mounted on each is a tire press, workbench, etc. The working platform is enlarged by letting down hinged side leaves which can be supported level with the floor by chains. A complete set of tools necessary to do repair work is carried with each outfit. The trailer is built so that either end can be drawn first.



Five-Ton Auto Trailer Equipped as a Tire-Repair Shop for Use by the American Forces in France: A Workbench, Tire Press, and a Complete Set of Tools are Included in the Outfit. Either End of the Trailer can be Coupled to the Truck Pulling It

LAWN-MOWER SHARPENER HAS ORIGINAL FEATURES

Special merit is claimed for a new lawn-mower sharpener on the ground that the blades sharpened with it are made to conform to irregularities, if any, that exist in the bed knife, so that they cut clean the full width of the mower. The sharpener consists of a steel bar with handles at each end and having a V-shaped bend near one end. On one side of the "V" a file is attached and near it is a foot, or guide. The mower to be sharpened is placed with its roller on the edge of a bench, while the handle rests on the floor. The sharpener is then inserted under the reel with the file against one blade and the guide on the bed knife. A keen edge, which will fit closely to the bed knife throughout its length, is obtained by moving the sharpener back and forth.



Lawn Mower in Position for Use of the Sharpener Which is Drawn Back and Forth on the Blade, with the Bed Knife Serving as a Guide

TYPEWRITER-RIBBON NEEDLE MAKES THREADING EASY

A handy office accessory, enabling a typewriter user to thread a machine with a ribbon more easily, consists of a gummed strip of rather stiff paper which is tapered at one end. After moistening the gummed side of the needle, the wide end is folded about the end of the ribbon. The latter can then be wound onto the spool without soiling the hands, and in less time than is usually required to thread a machine.

TINY GALLEY OF SUBMARINE HAS ELECTRIC STOVE

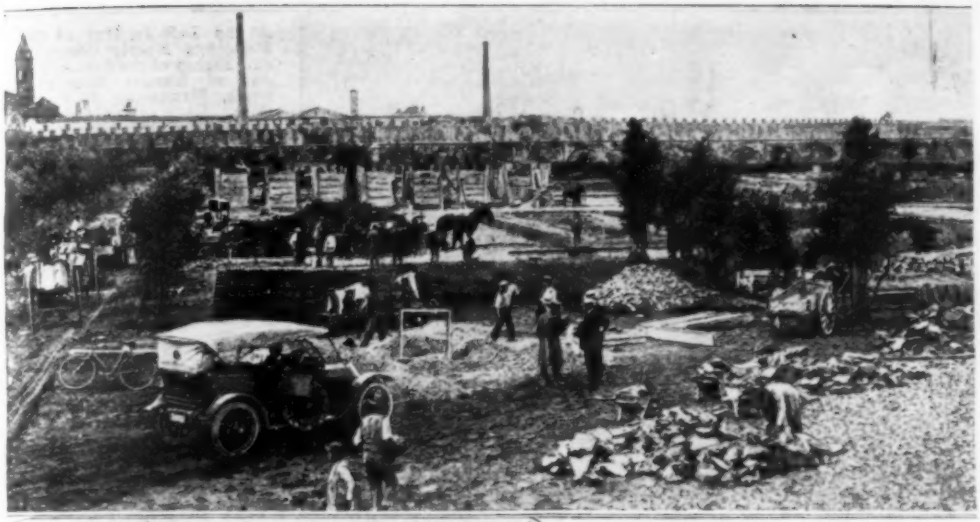
City flat dwellers whose "collapsible" apartments are supplied with cupboardlike kitchenettes have, in the popular vernacular, nothing on seamen who man submarines. Scarcity of space in a submersible permits the installation of only a tiny galley, which, in turn, is equipped with an undersized electric stove. Among other reasons, electricity is employed for cooking purposes in order that the air in a submerged craft may not be needlessly vitiated. In former days when the underwater boat was more of a novelty than it is now, no means were provided for the preparation of meals, and it was necessary, therefore, that cold food be eaten.

SPECIAL BANNERS WELCOME CITY'S SOLDIERS HOME

Over street intersections on all thoroughfares in Pasadena, by which returning soldiers and sailors might enter that city, have been hung special welcome banners. These resemble the conventional service flag and above each are the words, "Welcome Home." The flags bear a star, a red cross, the words "Pasadena Honor Roll," and "2,399," which is the number of Pasadena men in the service.

VOLTAGE OF EARTH CURRENTS AFFECTED BY THE TIDE

Because a difference of potential between gas and water-service mains was observed by an experimenter at St. Louis Observatory, on the island of Jersey, in the English Channel, studies were undertaken to prove the theory that the electric action moved in "tides." It was discovered that the mean electromotive force of .1 volt varied from maximum to minimum twice in 25 hours, solar time, corresponding with the tides of the sea, and therefore, secondarily, with the action of the moon. Maximum voltage was reached two hours before low tide with perfect regularity.



A General View of the American Red Cross Village Site, near Pisa, Taken during the Early Stages of Construction, is Shown Above

PHOTOS BY COURTESY OF THE AMERICAN RED CROSS

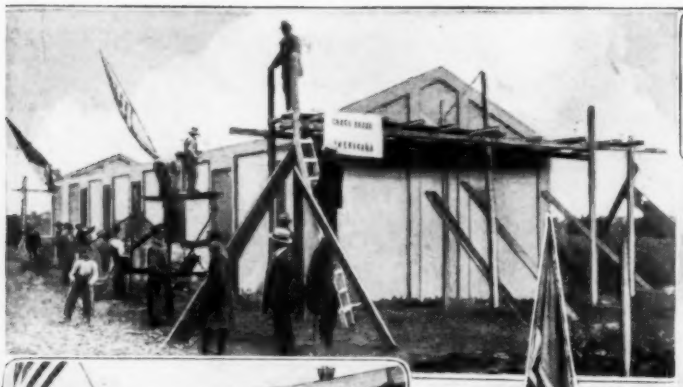
At the Left Are Loads of Building Material for the Village, Passing the Famous Leaning Tower; and at the Right, Canal Barges Used in Transporting Stone

AMPERES NEEDED FOR MOTOR TOLD BY ELECTRIC SCALE

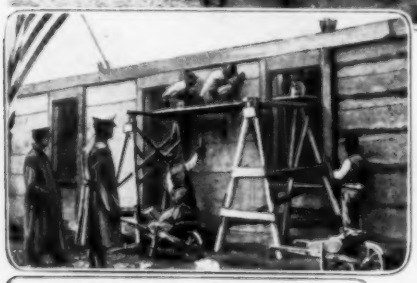
The number of amperes required by an electric motor, when the horsepower and voltage are known, is quickly indicated on a calculating scale simply constructed of cardboard and celluloid. On a square paper table vertical ruled lines read in horsepower, horizontal lines in amperes. A straightedge pivoted at one corner is graduated in volts. The meeting point of the known voltage and horsepower lines, when the straightedge is swung on the scale, indicates the required amperage. Separate arcs on the scale measure alternating current, and an additional scale may show the size of conductor needed.

AMERICANS REAR MODERN TOWN NEAR PISA FOR REFUGEES

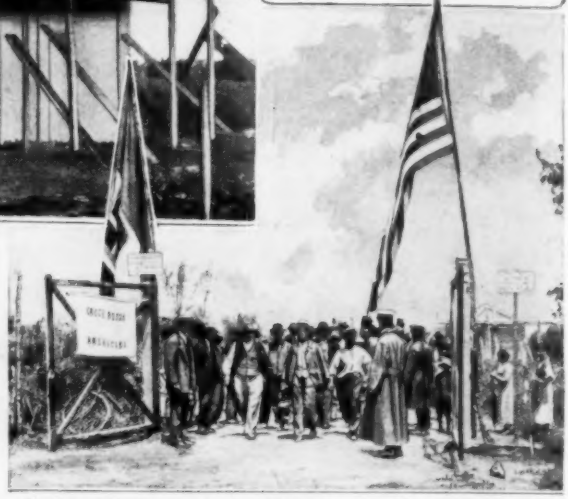
A suburb of 90 or more concrete buildings, sanitary and up-to-date in every particular, has been completed in quick time by the American Red Cross, on the outskirts of the ancient city of Pisa, Italy. It stands as a monument to America's generosity and ability promptly to meet a great emergency. The dwellings, together with the macadamized streets, sewers, electric lights, and other modern improvements, occupy a site not far from the famous leaning tower. A few months ago this land was nothing but vineyards and fields of corn. The village has been built to provide homes for artisans and their



At the Left Is One of the Buildings Nearly Completed. Eighty of the Structures Are of Similar Size and Style, Measuring 18 by 72 Feet. Each is Divided into Nine Rooms



Finishing the Walls: The Structures Are Like Barracks but Each is Made More Homelike by an Allotment of Ground for a Garden



Italian Workmen at the Entrance to 30-Acre Tract on Which They Built the Red Cross Village: Note the American and the Italian Flags Either Side of the Gateway, Typifying the Cordial Relationship That Existed

Unloading Slabs from the Railway Cars for Use in Constructing the Model Village: The Workmen Employed on This Interesting Project Were Italians, While the Supervising Officers Were Representatives of the American Red Cross. A Splendid Spirit of Cooperation Characterized the Work

PHOTOS BY COURTESY OF THE AMERICAN RED CROSS

families who fled from Venice during the war and since have not been in a position to return. Eighty of the structures are similar in style, measuring 18 by 72 ft., and contain nine rooms each. The village will accommodate 2,000 persons. At its center are several public buildings, a square with a drinking fountain, playground space, etc. The labor was done by Italians under the supervision of Americans. Garden plots have been set aside for the occupants of the cottages.

LONG CONCRETE PIPES CAST IN SIMPLE MOLD

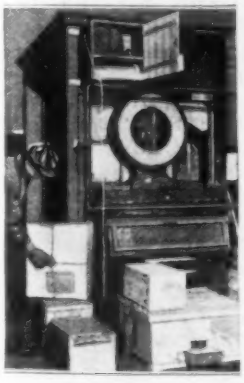
Two iron pipes, one nested inside the other, form the mold for a new European process of making long, thin pipes of concrete. The prepared mixture in a cylindrical stirring chamber is forced by compressed air down into the annular space between the iron pipes, whose diameter may be of any size to produce the desired thickness of wall.

LONDON-TO-SYDNEY AIR ROUTE PLANNED BY AUSTRALIANS

Considerable interest has been aroused by a report that commercial and financial interests in Australia are giving serious study to the problem of linking Australia and London by an aerial transportation line. Although it is not known on just what basis service would be maintained, it is nevertheless significant that a company has been formed that will provide the financial backing for surveying an air route to London. This, as planned, would proceed by way of Sydney and Port Said. The complete plan contemplates extension of the system to various parts of the British empire, once it is established and demonstrated as physically and commercially practicable for permanent maintenance.

PACKAGE-REPAIR OUTFIT IN EXPRESS OFFICES

In certain express offices a repair and wrapping kit has been installed above the scales which enables employes to render a much appreciated service in cases where the packages handled have broken open. The outfit is inclosed in a box with a hinged door and includes heavy and light cord, a hammer, nails, wrapping paper, etc. With this material close by it is comparatively easy to put a bursting package in shape for shipment, without delaying its delivery.



Opportunities for deaf-mutes have been found in the rubber-tire industry, and in one plant which employs a large number they are reported to be among the most expert workmen.

FRENCH EX-SOLDIERS LEARN TO RAISE RABBITS

An unusually interesting after-the-war undertaking in France is the work being done on a farm, under the management of the Union of Foreign Colonies, to re-educate soldiers in agricultural pursuits. Here considerable space is devoted to the raising of poultry and rabbits, the latter being valuable chiefly for their fur, which is much in demand as a substitute for blue fox, chinchilla, angora, etc. The rabbits on this farm are housed in sanitary hutches of special design, resting on supports a few inches above the ground and arranged in long rows, with a south exposure, beneath a shed. The cages are made in groups of six or nine and are placed in two or three tiers. Each compartment measures approximately 2 by 1½ by 3 ft. and is zinc-lined to half its height. Wire netting across the front supplements the light iron bars and prevents the food from being thrown on the ground. Rabbit and poultry raising is work to which many crippled and invalided soldiers can adapt themselves.

BY COURTESY OF LA NATURE, PARIS

Rabbit Hutches on a Farm in France Where French Ex-Soldiers are Learning to Raise Rabbits: The Pelts of the Latter are Sold as Substitutes for Blue Fox, Angora, and Other Furs

BARNACLES PROVING POPULAR AS A SEA FOOD

The barnacle, commonly regarded as a pest, is now being converted into soup and other forms of food, having taken its place beside clam chowder in various cafés and hotels in southern California. The piling of the Pine Avenue pier, at Long Beach, is incrusted with more than 100 tons of these and other sea creatures, which are being stripped off and will be utilized for food. Here and at San Pedro canning plants are

arranging to put up barnacles in large quantities. As the demand for barnacle soup increases, canning plants propose to

Harvesting Barnacles and Mussels for Soup from the Piling of a Pier at Long Beach, California

contract for the creatures removed from the bottoms of ships.

INFLUENCE OF WAR REFLECTED IN CHILD'S ROLLER SKATES

It is a far cry from the world war to a child's roller skates, but the influence of the one has placed its mark on the other, the armistice season and approaching peace notwithstanding. All of which is one way of calling attention to the fact that roller skates of the latest approved model are fashioned after the style of British fighting tanks. Novelty always being uppermost in the juvenile heart, it matters not that the new skates are a bit snowshoelike in size. Appearance is the main consideration, and grace of no consequence. The new skates are like all others except that they are surrounded by tanklike bodies made of light sheet metal.

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Something New for Gladdening the Childish Heart: Tanklike Roller Skates That in Appearance Closely Resemble Their Deadly Prototype

SOUTH AMERICAN CABLES WILL BE EXTENDED

Submarine cable communication between Buenos Aires, Argentina, and Montevideo, Uruguay, and between Rio de Janeiro, Brazil, and Cuba is provided for by grants of the South American governments to a cable company which already has the necessary material on hand or contracted for early delivery. The Brazil-Cuba cable will touch at places in northern Brazil, and possibly in the West Indies. Guantanamo, Cuba, is already connected by two cables with New York City and Colon, Panama.

MUSKRAT FARMS MAKE MONEY FOR SWAMP-LAND OWNERS

With every other girl wearing a fur coat, and a majority of the fur so used coming originally from the back of the humble muskrat, it is not surprising that a steady market prevails for first-class muskrat pelts at $1.00 to $1.50 each. Marshes favored by these animals become ready-made fur farms, highly profitable when, as sometimes happens, the crop of "swamp rabbits" runs from 50 to 100 to the acre each season. Marshland not being considered valuable, the rat farmer's investment is frequently quite small in relation to his returns. A 900-acre marsh on Chesapeake Bay, sold for less than $200 a few years ago, is now reported to bring its owner an annual gross income of more than $10,000, requiring the services of several trappers to harvest its crop of muskrat and mink.

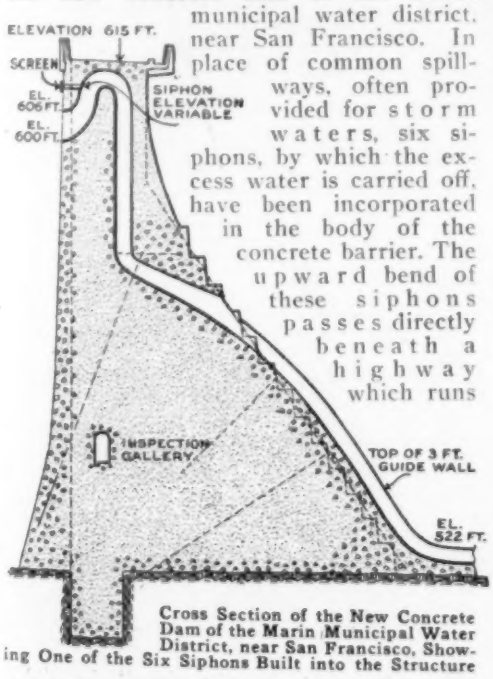
¶Several hundred thousand pounds of high explosives, including T. N. T. and picric acid, belonging to the French and Italian governments, have been ordered taken out to sea from Perth Amboy, N. J., and sunk, since practically none of this material can be used for any purpose other than the making of munitions.

SHIPBUILDING IN AMERICA REACHES PEAK IN 1918

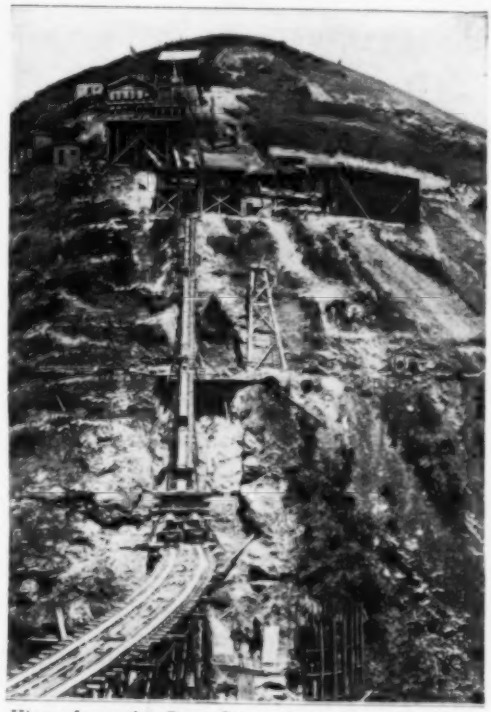
Just before the armistice cast its relaxing influence upon war industry American shipyards were approaching a monthly output of 400,000 gross tons. The American shipbuilding record for all of 1918 was 1,882 merchant vessels of 2,721,281 gross tons, officially numbered by the Commerce Department of the Bureau of Navigation and including a small amount built for the French. All but 124,255 gross tons were seagoing ships. The total seagoing tonnage of 2,597,026 was comprised of 1,861,321 gross tons in steel ships, and 735,705 credited to wooden ships. While December naturally showed a marked falling off, the 1918 total compared with 1,699 ships in 1917; but the 1918 tonnage more than doubled the 1917 figure of 1,034,296. In seagoing ships 1918 produced a fleet of 821 against only 279 for the previous year. These figures include both steel and wood vessels, with the majority always of steel.

MATERIAL FOR CONCRETE DAM HANDLED BY GRAVITY

Two features lend particular interest to the new concrete dam of the Marin municipal water district, near San Francisco. In place of common spillways, often provided for storm waters, six siphons, by which the excess water is carried off, have been incorporated in the body of the concrete barrier. The upward bend of these siphons passes directly beneath a highway which runs along the top of the dam. The other feature has to do with the economical handling of materials used in construction. Advantage was taken of a high hill, at one end of the dam, from near the top of which rock was quarried for the concrete. A crusher for breaking up the rock was installed not far below the quarry, and from here the stone was fed by gravity to a mixer somewhat lower down. The wet aggregate was then sent down to a bunker on a level with the crest of the dam, where dump cars were filled which distributed the material as needed.



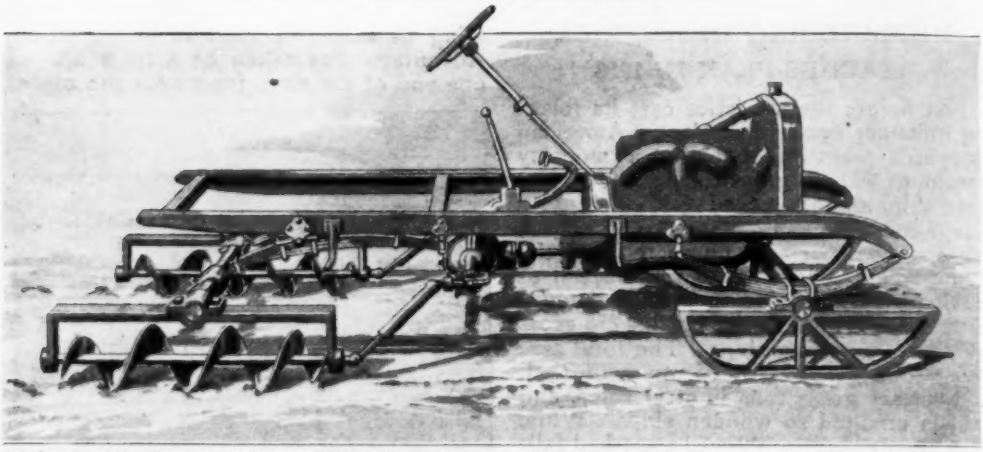
Cross Section of the New Concrete Dam of the Marin Municipal Water District, near San Francisco, Showing One of the Six Siphons Built into the Structure



View, from the Dam Site, of the Hill Where the Rock was Quarried: On the Slope Are the Crusher, the Concrete Mixer, and the Chute Leading to Bunkers near the Base

PARIS TO GREECE BY NEW RAILWAY LINK

By May, 1919, through trains from Paris to Athens will be running over the railway line completed two years ago but denied to international use by the war. Trains leaving Paris Saturday noon will arrive in Athens the following Tuesday morning, passing through Milan, Venice, Trieste, Agram, Belgrade, Nish, Uskup, and Larissa. Anglo-Indian and other far-eastern mails and passengers will be carried. A seven-mile extension from Athens to Piræus will greatly increase the importance of that port.



An Automobile Converted into a Motor Sled by the Substitution of Runners for the Front Wheels and Spiral Propellers for the Rear Wheels: The Rear Axle is Here Installed Just Back of the Transmission Case, and Power is Conveyed to the Propellers through Diagonally Placed Shafts Having Universal-Joint Connections at Either End

SUPPORT MILITARY BRIDGE BY HUMAN PIERS

Military bridges are of all the varieties suggested by the demands of expediency, but the one illustrated here is unusual mainly in its supports or "piers." In one of the last battles of the British troops, the immediate necessity of crossing a stream under fire was met by marching a

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British Troops Crossing Stream under Enemy Fire on Plank Bridge Upheld by Their Comrades

number of men into the water, where they supported a broad plank upon which their company made the crossing.

SPIRAL PROPELLERS MAKE ANY CAR A MOTOR SLED

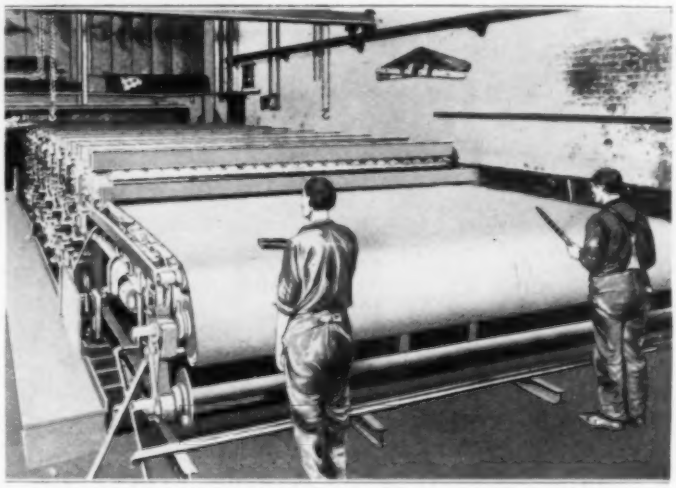
An attachment recently patented in this country and Canada, with which any automobile can be converted into a motor-driven sled, represents a decided departure from the conventional type of propelled vehicle with runners. Ordinary runners are substituted for the front wheels of the converted car, while at the rear are two propellers resembling spiral conveyors. The rapid revolving of these members in the snow gives the car its speed. Power is conveyed through the rear axle and differential, which are installed directly behind the transmission case. At each end of the axle is bevel-gearing through which power is transmitted to the propeller shafts. The screws are made smaller in diameter at the ends than in the center so that they will more easily pass over obstructions. Each shaft is composed of two sections, one telescoping in the other, permitting the propellers to adjust themselves to unevennesses in the road without loss of power.

TUNGSTEN CONTACT POINTS NEW PLATINUM RIVAL

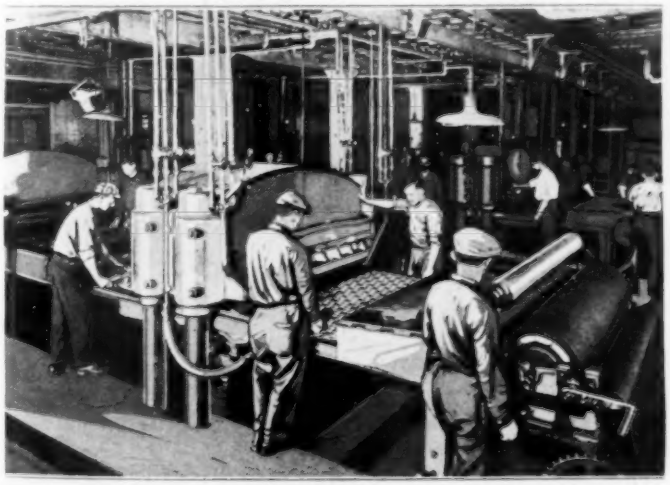
Among the new uses for tungsten an important one to the electrical trade is its effectiveness for contact points. Tungsten contacts must be short because of their high resistance, and in unusual cases need artificial cooling. They are fastened to their springs by spot welding. The process can be used for the smallest contacts, and is reported to be entirely satisfactory as a substitute for platinum.

SPECIAL MACHINES FOR MAKING LINOLEUM

Ingenious machinery is required to make inlaid linoleum so that the sections of various colors are united into a single solid mass and at the same time the lines of the pattern are sharply defined. Linoleum is made with a backing of canvas, or burlap, on which colored "dough" is pressed and dried in conformity with the desired pattern. This dough consists of oxidized linseed oil mixed with finely ground cork. The machine by which the dough is applied is provided with a metal pattern that outlines the design to be made, by means of thin vertical partitions. The backing is drawn into place under this pattern and then the latter descends on it. Each section of the pattern is connected with a reservoir containing thick dough of the proper color, which is forced through the pattern onto the backing, after which the pattern lifts and the backing passes on a few feet. Then the process is repeated. Tremendous pressure and heat cause the parts of the design to fuse. Finally the linoleum is dried, or "cured," for two or three weeks. In making cheaper grades of linoleum the pattern is printed with a machine resembling a printing press, the functions of the type being performed by wooden blocks arranged to reproduce the desired pattern.



Running Linoleum, Not of the Inlaid Sort, through a Machine Like a Printing Press, in Which Wooden Blocks Forming the Pattern Take the Place of Type



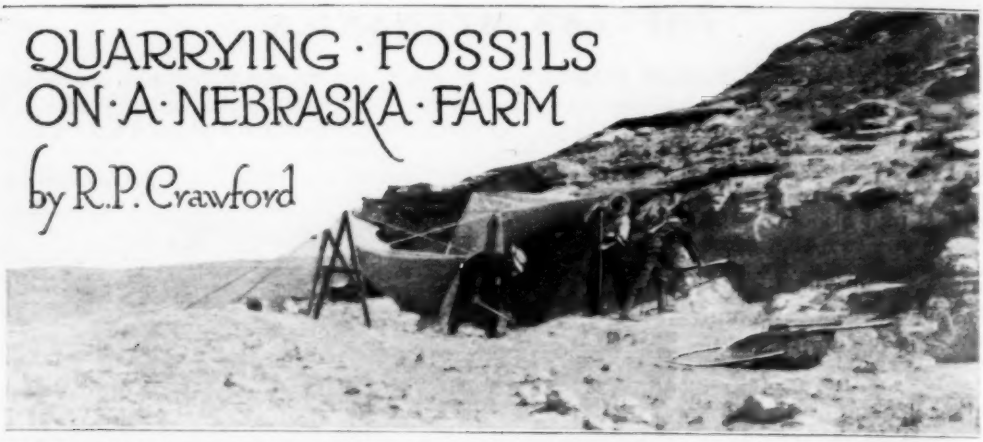
Making Inlaid Linoleum: A Metal Pattern is Pressed Down over the Canvas or Burlap Backing and Then Dough of Various Colors is Forced into the Compartments That Compose the Pattern

ELECTRIC CARD SORTER DEALS FARM FACTS

Agricultural information on cards in the Connecticut state librarian's office can be quickly obtained by pressing the button of an electric sorting machine, such as has long been used by railroads, banks, and the government. Facts collected by farm-census enumerators in five counties were carefully carded and the electrical machine installed. Now a farmer who is interested in a supply of seed corn or oats, some young pigs, a grain binder, or any other agricultural necessity, need only go to the library and throw a switch, and all the available information will immediately be laid before him. Forty separate subjects are covered by the data.

QUARRYING · FOSSILS ON · A · NEBRASKA · FARM

by R.P. Crawford



This View Well Illustrates the Conditions under Which the Fossil Collectors Work on the Cook Farm in the Northwest Corner of Nebraska, Now Known to Be Rich in Remains of Prehistoric Animals. Museum Men from Many Parts of the Country have Made Excavations Here

WHERE do the museums of the country get their strange and curious skeletons of prehistoric animals? If the skeleton is a "dinohyus" or a "moropus," one may be quite sure that it came from the farm of James Henry Cook in the northwest corner of Nebraska; and the chances are almost equally good if the specimen happens to be a saber-toothed cat or a many-toed horse, or almost any of those queer animals that belong to the early Miocene period. Most ranchmen and farmers are quite content to raise the ordinary sort of stock, but here is a ranch that is most widely known because of its output of prehistoric animals. For more than a decade paleontologists from the great universities and museums of this country have made regular trips to these fossil quarries.

This Slab, Which Measured Only Four by Seven Feet, Shows What a Variety of Fossils are Found in Certain Layers of Rock, near the Bases of the Hills

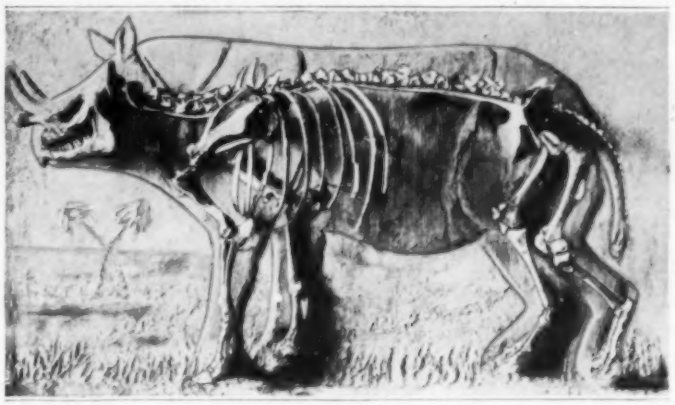
The Cook farm and ranch, located close to the Wyoming line, comprise some 15,000 acres. On the eastern edge of the ranch the Niobrara River has laid bare two hills, from both of which scores and scores of fossil skeletons have been quarried. In the summer it is no uncommon occurrence for representatives of half a dozen eastern institutions to pitch camp near these hills and spend several months digging out the fossil bones which, when worked over in the museum, form the queer-looking skeletons. The University of Nebraska, under the direction of Prof. E. H. Barbour, early began work on the fossil deposits, and Yale, Columbia, Carnegie Museum, and the American Museum of Natural History are some of the larger institutions that have followed suit. One summer 21 collectors were at work on the ranch.

The fossil bones are found in layers near the bases of the hills. If one has seen corn stored in a crib, he can visualize the manner in which the bones are piled in the layer. A slab, about 7 ft. long and 4 ft. wide, was taken out bodily by investigators from the University of Nebraska. It is a piece of rock literally packed with fossil bones of all sizes.

Extensive quarrying operations have to be carried on, however, in order to get at the bone beds. Fifteen or 20 ft. of rock is first blasted away with dynamite, and horses and scrapers are then used to clear off the shattered rock. When the top of the bone layer is reached, the scientists begin work with pick and chisel. Large blocks of bones are pried out and each is marked so that it can be fitted into the right place later on in the museum. These slabs are wrapped in strips of burlap, which have

been dipped in plaster of Paris. A strong jacket around the bones is thus secured. The blocks are then packed in boxes stuffed with hay, and are hauled overland by horse and wagon to the railway station. Very little effort is made to separate the individual bones from the rock at the quarry, practically all of this more difficult work being left for the museum.

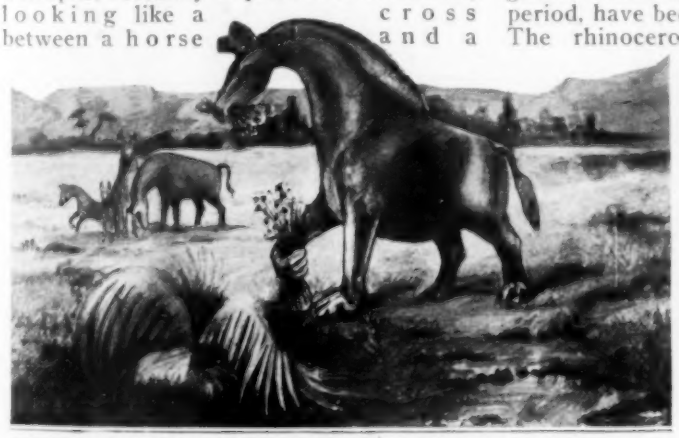
One of the remarkable discoveries in these beds was that of the dinohyus, or giant hog, but two specimens of which are known in the world, one in the museum of the University of Nebraska and the other in an eastern museum. The size of this prehistoric porker may be judged from the skull and jaw, which together are 38 in. in length. The fore leg in the museum of the University of Nebraska measures 7 ft. from the tip of the toes to the top of the great shoulder blade. This animal resembled, on a larger scale, the wild boar.



Fossil Skeleton of a Rhinoceros Found on the Cook Farm, Showing the Method of Mounting Employed by the University of Nebraska

The Skull and Jaw of an Animal of Great Size Resembling a Boar: The Fossil Shown Measures 38 Inches Long

Another discovery of interest is that of the moropus, certainly a queer sort of animal, looking like a cross between a horse and a rhinoceros. In short, it appears to have had the body of a rhinoceros and the head of a horse, and, in addition, claws on its feet. Its skull is practically the same size as that of a horse, and the animal probably stood 7 to 8 ft. high at the shoulders. Related specimens of this curious beast have been found in Europe, but it is believed that this spot in Nebraska is the only place in North America where complete skeletons are found. Eastern museums have been unusually eager to secure specimens of the moropus, and practically all those in the metropolitan institutions came from this spot in Nebraska.

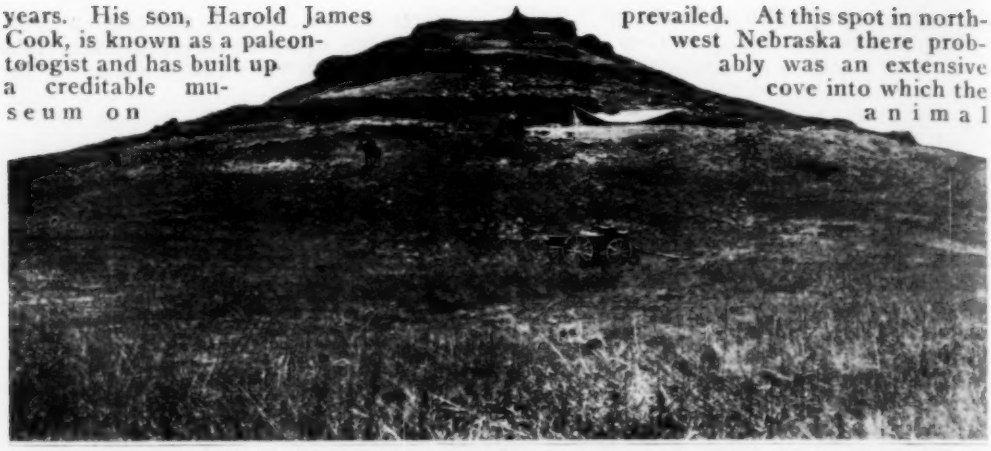


A Scientist's Conception of a Prehistoric Animal Which Was Half Horse and Half Rhinoceros

Countless numbers of fossil skeletons of the rhinoceros, together with cats and dogs of the Miocene period, have been unearthed on the ranch. The rhinoceros is the most common. Sometimes 25 skulls are found in a cubic yard of rock. A new method of mounting these specimens has been originated by the University of Nebraska. It consists, as shown in one illustration, of making a plastic background of cement, in front of which the skeleton is mounted. The background shows in low relief the proportions of the living animal.

Captain Cook has given the scientists the freedom of his ranch for many

years. His son, Harold James Cook, is known as a paleontologist and has built up a creditable museum on the ranch. The origin of the fossil deposits is explained by Professor Barbour, the state geologist. At the time the bones were laid down, river and lake conditions prevailed. At this spot in northwest Nebraska there probably was an extensive cove into which the animal skeletons were washed. In time they were covered with mud and sand, which later formed rock, thus preserving the remains for posterity.



One of the "Bone Hills": The Canvas Indicates Where Quarrying is Carried On. It is Believed That at One Time Water Covered Part of This Region and That the Place Where the Bones are Found Was Once a Cove into Which the Skeletons were Washed

BIG MACHINE CRACKS NUTS BY CENTRIFUGAL FORCE

A nut-cracking machine weighing 5,500 lb. has been built in Los Angeles for use in Guatemala, Central America, in cracking coquito nuts, from which a valuable oil is extracted. These nuts grow wild on a variety of coconut palm and are about the size of a large black walnut with its shell on. The inside hull of the coquito nut is about ¼ in. thick and so hard that a pressure of several hundred pounds is required to crack it. The machine, instead of crushing or grinding the nuts as might be supposed, cracks them by centrifugal force. The nuts are fed into a drumlike casting, 6 ft. in diameter, where they strike a swiftly revolving wheel that hurls them with terrific force against breaker blocks that line the drum. This

Left: A Bunch of Coquito Nuts. A Tree will Bear from Six to Twelve Bunches of These Nuts, Each Bunch Weighing from 60 to 80 Pounds. Right: Drum of the Machine Which has been Built to Crack Coquito Nuts by Centrifugal Force

shatters the nuts and the broken pieces fall into a discharge pipe, equipped with fans that separate the kernels from the hulls. It is estimated that the machine can crack 10 tons an hour. The region where it will be employed has great numbers of these coquito palms. The kernels of the nuts are about 70 per cent oil—a product used in making soaps, candles, cosmetics, and the like.

WILD FOWL FIND SANCTUARY ON LOUISIANA LAKE

A stretch of water two miles long and a mile wide, with 1,000 acres surrounding it, constitutes Louisiana's first offering of a permanent refuge for wild life of all kinds. Lake Peigneur, near New Iberia, in Louisiana's southern tier of counties, has been turned over to the state department of conservation by its owners, with the option of purchase after ten years. Agents of the department will fence and guard the preserve, which will be stocked with quail, grouse, wild turkeys, and other game, all of which will be supplied with food and protected from hunters and natural enemies. Dredging and damming operations in the cypress swamps have provided home sites for herons, egrets, and other tree-nesting birds, while selected shrubs and trees attract the migratory fliers. The department of conservation holds contracts with riparian-right holders to allow no shooting or trapping on their land for ten years.

PONDEROUS ARMY TRACTOR MAKES LONG CRAWL

Though rated at only three miles an hour, an 85-hp. tractor of the endless-tread type "ran" into Detroit just six days after it left its factory 480 miles away, its engine running continuously during that time. From Detroit it was ordered to proceed overland to the army proving grounds at Aberdeen, Md. Varied road conditions proved unable to stay the steady progress of the big crawler. The machine was driven by a crew consisting of a lieutenant and four enlisted men.

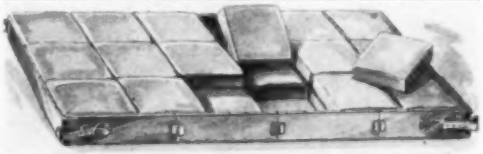
¶Warnings from the United States Weather Bureau issued for the benefit of live-stock interests saved over 100,000 new-born lambs in the San Francisco district in one month, and protected great numbers of sheep by causing postponement of shearing.

"BUNGALOW HAT" KEEPS RAIN OFF CHECKER'S RECORDS

A wide-spreading head covering, chiefly of wood, which his fellow workers have nicknamed a "bungalow hat," has been built by a material checker, employed mainly out of doors, in a Portland, Ore., shipyard. Its purpose is to shelter the wearer and his tally sheets from the rain. The device measures 35½ in. long, 21 in. wide, and 12 in. high. The supporting frame rests on the shoulders and the whole is held in place by straps connected with a belt passing around the chest. A perpendicular wooden strip extending down the wearer's back also helps to steady the novel headgear.

SANITARY HOSPITAL MATTRESS MADE IN SQUARE SECTIONS

A new type of mattress particularly suited to hospital needs is made in sections about 10 in. square, which are held together by a light framework. The two principal advantages of this construction are that soiled sections can easily be removed for cleaning and, in case the patient is apt to develop bed sores, relief can be given by removing the squares immediately beneath the sensitive portions of the body. The squares being interchangeable, they can be rearranged so that all get about the same wear.



A Mattress Made in Square Sections and Especially Suited to Hospital Needs: Any Portion can be Easily Removed for Cleaning, or to Add to the Patient's Comfort

REVIVING HANDICRAFTS IN AMERICA

By W. D. GOODWIN

NEW opportunities are offered to men and women to become wage earners in their own homes, independent of factory and industrial conditions, by the establishment of hand-loom industry and textile studios, in New York City.

Tapestry Weaving on a Hand Loom: At Present There Are Only About 16 Professional Tapestry Weavers in the United States

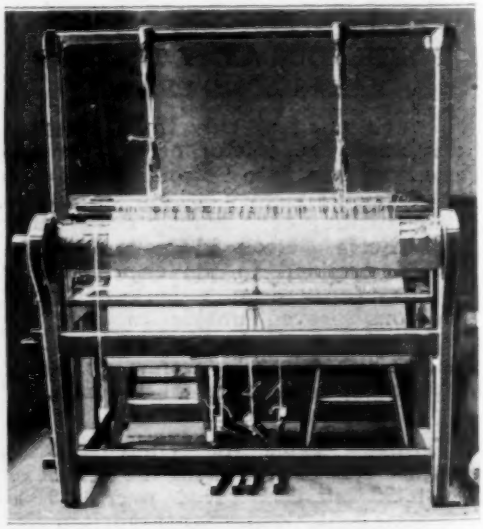
There are maintained in these studios, schoolrooms, loom rooms, and an experimental dyeing plant. French, Swedish, Italian, and Russian looms are used, as well as a specially constructed loom for home uses. Expert tapestry weavers are employed, who act both as teachers and producers. When necessary, the home looms are made to meet the needs of many individuals, thus enabling cripples, or those who have been maimed in the war or in industrial pursuits, to take up productive work and become wage earners. Students readily acquire skill in weaving simple designs and gradually progress to the more complicated fabrics, all of which possess artistic merit as well as serve many useful purposes.

This is the first attempt to establish, on a large scale, such an enterprise in the United States. Its patrons and promoters feel confident that they are laying the foundation of what is to become a great industry.

The objects and purposes of the undertaking are to supply the existing demands for beautiful handmade tapestries; to revive and foster the art of hand-loom weaving in American homes; to teach and train people who are not wage earners to become skillful in making ornamental and serviceable textile fabrics; to furnish employment to those who desire to take up such work as a profitable occupation and means of livelihood amid pleasing surroundings.

There are many men and women in the United States who are not wage earners, perhaps through no fault of their own, but who are willing, capable, and industrious. To the crippled soldiers, or those who have become more or less incapacitated from any cause, as well as to those who are in good health but whose time is not fully occupied, opportunity is now presented to engage in productive labor under ideal conditions, by turning their leisure hours to good account. This employment affords people an incentive to develop their talents, as, for instance, by more closely associating weaving with its allied arts in connection with textile needs, architecture, decorations, and sculpture.

In these studios instructions are given in weaving, designing of hand-loom fabrics, tapestries, needle-point embroideries, guimpes, tassels, and the copying of antique fabrics of all periods; the making of unusually artistic costumes for private or theatrical use, their fabrication being

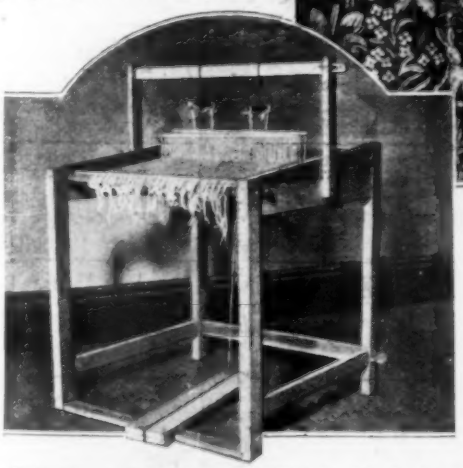


Swedish Hand Loom for Making Cloth 36 Inches Wide: By Changing the Reeds through Which the Threads Pass Fine or Coarse Material can be Produced

fully explained and made attractive to the pupils. A course of 10 lessons of two hours each is given, which may be received either in the morning or afternoon. Besides instruction in the subjects mentioned above, dyeing of threads is also taught; the free use of looms and all materials required being supplied by the studio.

Full-size drawings representing subjects to be produced are supplied in colors, in many instances by people who order special articles made of textile materials. These designs serve as working models for the weavers when placed underneath the warp threads of the loom, where they may be easily seen and followed. The ability to use the fingers quickly, match colors correctly, and thus turn out work rapidly, contributes much toward the weaver's success in fabricating the various designs. A far greater demand exists for handmade tapestries than can be supplied.

At the present time, there are only about 16 professional tapestry weavers in the United States, and it may therefore readily be seen that a splendid opportunity presents itself for the constant employment of those who become skillful in the art of constructing such fabrics.



This Type of Loom can be Fitted with Various Attachments for Weaving Linen, Silk, Cotton, Homespun, Tweed, and Tapestry

Part of a Screen Made in a New York Textile Studio

The wonderful handicraft imported into the United States has been developed in European homes, but there is no reason why work of equal merit and design should not be produced here, which will be more keenly appreciated by the purchaser because "made in America."

By providing adjustments and additional parts for the old pattern looms, those for the home are made adaptable for using many different fabrics, such as linen, silk, cotton, homespun, tweed, and tapestry weaving. These modernized hand looms are capable of turning out fabrics 27 in. wide, are made of light but strong materials, and are easily dismantled and reassembled.

A Small Hand Loom being Used to Make a Girdle: The Skilled Operator Makes Up Her Design as She Weaves

This revival of handicraft work, it is believed, will be materially helped by the fact that many people of foreign birth in this country have been trained in similar tasks in their native lands.

HEAT AND COLD ALTERNATE IN TESTING DEVICE

Artificial aging as applied to nickel-steel clock springs, arms of precision balances, thermometer glass, and similar parts demands a periodical variation or oscillation of temperature. This condition may be produced by connecting two relays in circuit with a thermometer column at the desired high and low points respectively. The upper contact turns off the heat, while the lower contact turns it on. The device is also useful in testing building materials.

CURIOUS SIGNALING DEVICE USED BY ITALIAN ALPINI

It seems safe to assert that practically every modern means of long-distance communication was employed in spread-

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Spreading the News of the Armistice from Peak to Peak: An Odd Method of Signaling Used between Italian Alpini Outposts

ing the news of the armistice to soldiers on the various fronts. Perhaps none of the several systems of signaling brought into use on that momentous occasion is more unfamiliar to the average American civilian than that utilized at many scattered Italian outposts high in the snow-covered mountains. The transmitting device is made of stiff accordion-plaited cloth, bearing alternate stripes of red and white. When held loosely, only red is displayed; when drawn tautly, the white is made visible. Handles at each side enable the operator to manipulate the contrivance rapidly and signal by means of a code. Thus it was that the news of the armistice was carried from peak to peak, where little bands of Alpini maintained vigil.

¶Attention has recently been called to the possibilities of using beryllium in preference to aluminum in certain kinds of construction, because it is so much lighter than the latter metal, and because its strength, it is claimed, is twice as great.

PROPOSE LINERS BE EQUIPPED WITH MAIL-CARRYING PLANES

To improve the transatlantic postal service, the suggestion has been made that mail-carrying liners be equipped with fast-flying seaplanes. Execution of such a plan, it is contended, should hasten the delivery of important correspondence between New York and London, for instance, by 24 hours. A ship, when a few hundred miles from the coast, would dispatch a seaplane with "express" mail, thereby enabling the latter to reach its destination hours earlier than is now possible. In a similar manner service between South America and the European continent could be expedited. Vessels crossing from this side of the Atlantic, for example, could release planes when at points 300 or 400 miles off Lisbon or Gibraltar.

NOVEL ROLL OF HONOR TAKES PLACE OF SERVICE FLAG

Having found difficulty in keeping its service flag up-to-date, a public-utility company in Columbus, Ohio, has substituted for it a large red mat, suitably framed and having a white rectangular center. The latter is divided into 12 sections, 10 of which have been filled with pictures of men in the service, together with summaries of their military records.

The Central Portion of a Telephone Company's Honor Roll: Surrounding This Is a Field of Red, and the Whole is Inclosed in a Suitable Frame

MOTOR-CAR FIELD KITCHENS USED IN DUTCH ARMY

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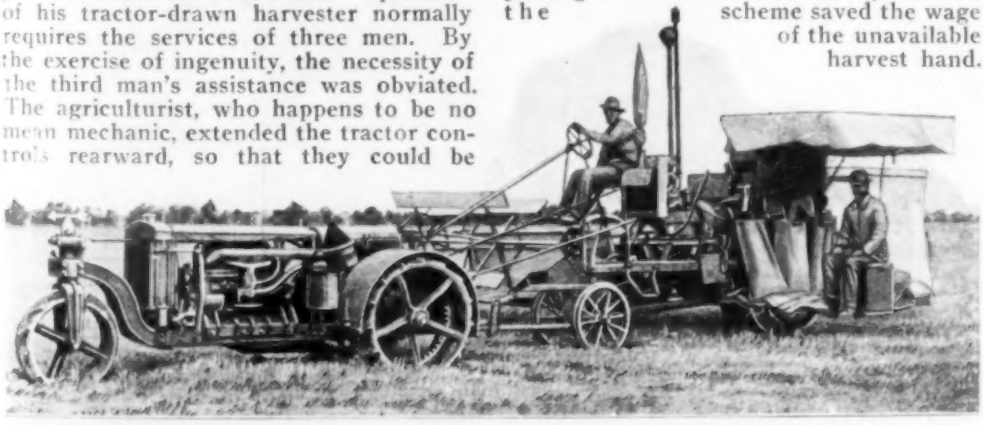
THOSE who think chiefly of wooden shoes when picturing Holland and its people, perhaps do not visualize it as a country with a well-trained army outfitted with such modern field equipment as motor-car kitchens. The assumption seems particularly plausible in view of the fact that our own army has been regularly supplied with such conveniences only a comparatively short time. The photograph reproduced herewith illustrates the type of mobile kitchen with which the Dutch land forces are supplied. In passing, it is not altogether irrelevant to mention that Holland's defense system consists of a militia with strong cadres founded on universal service and that as far back as 1908 the war strength of its first line was 105,000, and that of its second line, or reserve, 70,000 officers and men.

TRACTOR AND HARVESTER OPERATED BY TWO MEN

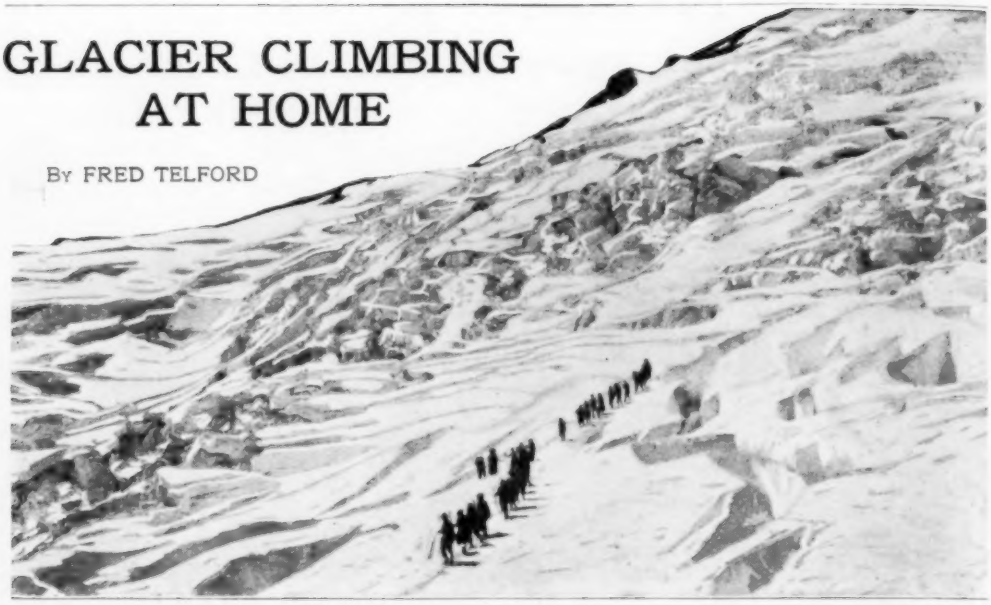
To have labor shortage at the busiest season of the year work to his advantage, instead of against him, was the paradoxical situation that marked a far-western grain farmer's latest harvest. Operation of his tractor-drawn harvester normally requires the services of three men. By the exercise of ingenuity, the necessity of the third man's assistance was obviated. The agriculturist, who happens to be no mean mechanic, extended the tractor controls rearward, so that they could be manipulated from the forward seat of the harvesting machine. Thus provision was made enabling one man to serve at two posts. In addition to meeting the perplexing situation in a satisfactory manner, the scheme saved the wage of the unavailable harvest hand.



Handicapped by Labor Shortage, a Resourceful Farmer, by Extending the Tractor's Controls Rearward, Rearranged His Tractor and Harvester Combination So That One Man could Do the Work of Two

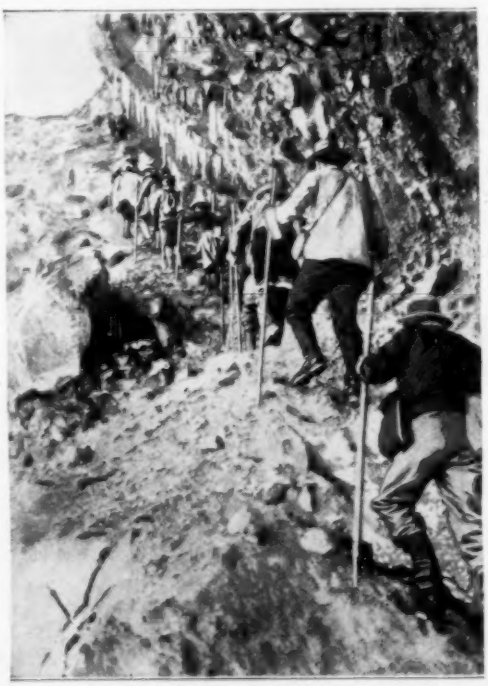
GLACIER CLIMBING AT HOME

By FRED TELFORD



A Bit of Easy Going on the Nisqually Glacier, Rainier National Park, Washington: This Section of the Trail Is So Good That the Party has Dispensed with Ropes—Safeguards Which are Never Omitted Where There Is Any Danger

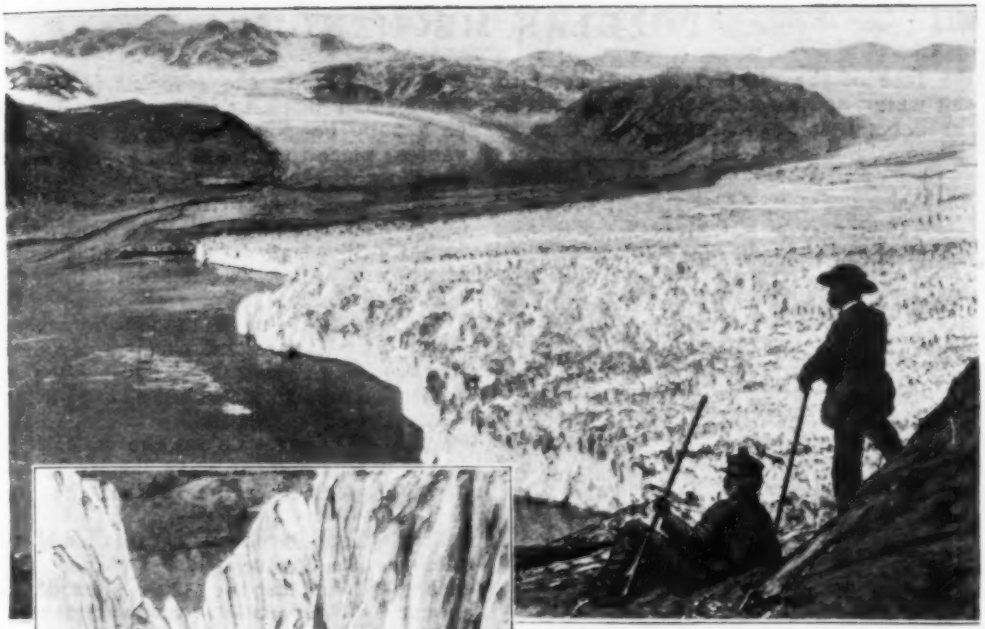
THANKS to the "see-America-first" movement and the difficulties of European travel due to the war, many Americans are finding out that they can have all the thrills of seeing and climbing glaciers without paying the Swiss innkeepers and guides a stiff toll. Right here in the United States easily accessible but little-known glaciers show the awe-inspiring crevasses and wonderful changing colors that one who has ever had first-hand experience with these slow-moving rivers of ice can never forget.



On the Path—if Such It can be Called—Leading to Nisqually Glacier: This Rock-Strewn Route Gives Many Climbers Quite as Much Pleasure as the Glacier Itself

Among the national parks easily accessible by railroad, that furnish the sport of glacier climbing, are Glacier Park and Rainier National Park. Some of the thrills obtainable in the latter are shown in the photographs. At a distance, glaciers have a deceptive trick of looking smooth and offering easy footing. Near at hand, however, the immense crevasses with their depths and the extremely rough surface, due to uneven melting and inequalities in the bed, put a different face on affairs. Where the surface is much broken and, in addition, slopes strongly, even the novice realizes the need of ropes, creepers, and alpenstock.

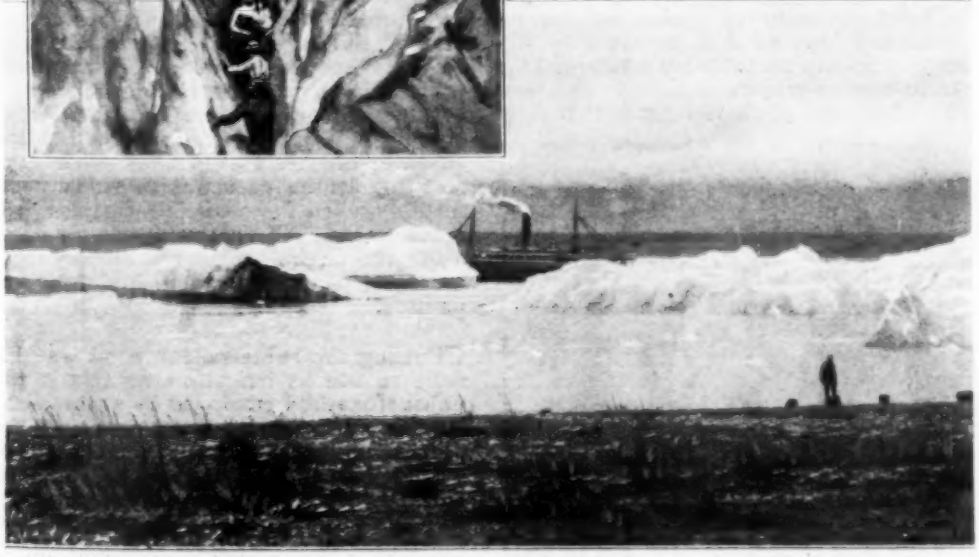
It is Alaska, however, that offers the de-luxe glacier sight-seeing. This little-known land not only has the largest glaciers—big enough to make Switzerland's pride look insignificant—but also the most easily accessible. In fact, during the summer season the excursion steamers run right up to



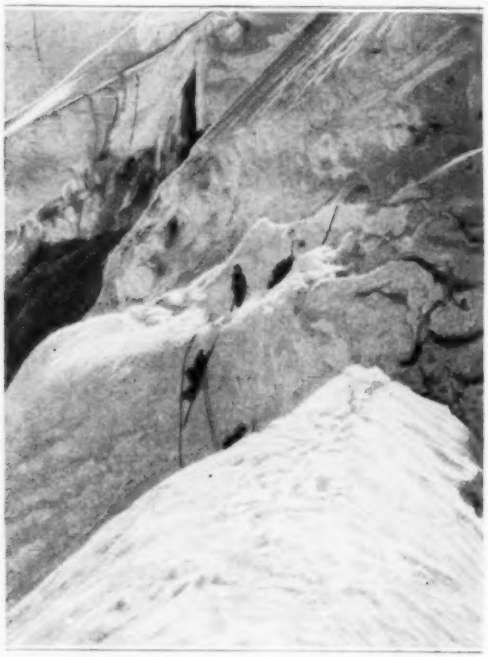
Above: An Arm of Muir Glacier, Alaska, from an Elevation of 1,800 Feet; a Panoramic View That Is Worth All the Climb. At This Height It Is Difficult Properly to Estimate the Size of Objects in the Distance. The Ice Wall Fronting the Sea Is Several Hundred Feet High, and the White Specks in the Water Are Icebergs Weighing Hundreds of Tons

Left: Single File up a Deep Crevasse in Nisqually Glacier, Rainier National Park. The Beauty of This Steep-Walled Icy Cañon is Much Enhanced by the Wonderful Colors Produced by the Refraction of Light in the Ice. The Path Is Not So Difficult to Ascend as It Appears

Below: A Summer Excursion Steamer among Icebergs in Glacier Bay, Alaska. Vessels Carrying Sight-Seers Often Run within a Quarter of a Mile of the Foot of a Glacier, Giving an Excellent View of the Slow-Moving Mass



the face of the glaciers that descend to salt water, and thread their way in among the bergs that have broken off. One of the sights along the seacoast is that of the iceman hitching his gasoline launch to a baby berg and towing it to a convenient place to cut out his supply. Perhaps nothing else does so much to impress the sight-seer with the futility of man's efforts compared with nature, as to note the tiny hole made in even a small berg by taking out several hundred tons of ice.



The Glacier Climber can Find Rough or Smooth Going, as He may Wish, in Alaska. Here are Shown Some of the More Adventurous Sportsmen Making Their Way across Perilous Crevasses

For the man—or woman—who wishes to do more than sit at ease on the deck and view the glacier front and broken-off bergs, the steamers make a stop of a few hours at one point to allow a visit to the glacier. A short ride on the railroad, a walk of three miles over an easy trail, and the sight-seer is at the foot of the glacier.

This particular trail is also easy to climb, as the surface is little broken. The ease with which the trip is made is shown by the fact that one summer recently an elderly couple, past 60 and not especially robust, actually spent two hours climbing over the top of the lower portions—and arrived back in time for lunch before the boat sailed. At no other place in the world is this possible.

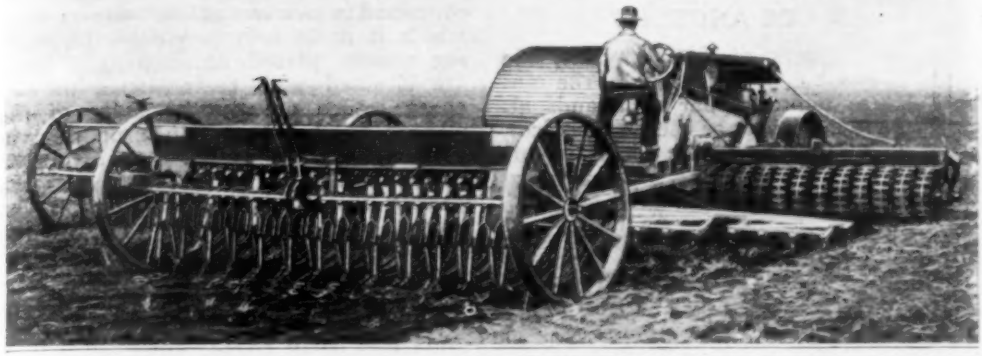
Attempting to describe glacier climbing is like painting the lily. The photographs give some idea of the sport, but, of course, fail completely in portraying the varied and beautiful coloring.

THEATER CHAIRS THAT RAISE AND LOWER THE OCCUPANTS

Chairs so mounted that they can be raised and lowered 2 ft. or more by the occupants have recently been patented for use in motion-picture and other theaters. The advantage of these seats is that they lift the users high enough to give them a view of the stage unobstructed by persons passing to and fro immediately in front of them—a frequent occurrence at the "movies." Each chair is supported by a telescoping tubular column and a preferable means of operating it is a motor-driven worm, within the column, controlled by a push button attached to the chair. Foot rests suspended from each seat enable the occupant to sit as comfortably when the chair is raised as when it is lowered. Alternative means for operating the chairs are worms driven from a central power plant, and hydraulic apparatus.

Theater Seats with Telescoping Supports Which can be Extended to Raise the Occupants So That They may Have an Unobstructed View of the Stage

¶ Putting the subterranean runways of a mole to use as irrigation tunnels is the unusual method employed by a woman of Bryon County, Okla., to get even with the pests that were undermining and destroying her garden. By repeatedly filling the mole burrows with water, she effectually turned damage into profit and banished the moles.



The Tractor's Novelty is Here Shown to Be Purely Incidental, Capacity for Work Being the Chief Attribute Claimed for It. The Picture Above Explains How Implements are Handled at the Sides by Attachment to the Frame

BROAD DRIVING DRUM IS ONE FEATURE OF FARM TRACTOR

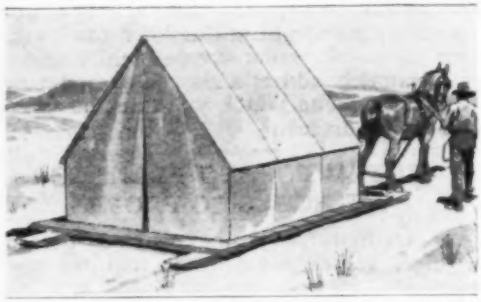
There are other reasons than mere novelty of design that are causing interest to be manifested in a drum tractor that has been developed for heavy-duty farm work. By its very nature it is distinctive in appearance, but of greater importance are some of its mechanical features. Among these are its driving system and frame, the latter being essentially of one-piece construction and suspended beneath, instead of being supported above, the rear axle.

No differential is employed. Power is transmitted through a simple gear set to a jackshaft. Two heavy chains, working in oil, engage sprockets secured to the drum itself, and pull uniformly at each side. The frame is the drawbar, and since power is delivered in a straight line, the load may be attached at whatever point best suits conditions. Furthermore, the simplicity of the frame construction permits arms to be extended from the sides and harrows to be hitched to them.

The tractor is equipped with a four-cylinder engine and works at a speed of from two to two and a half miles an hour. The drum is 54 in. wide and of equal diameter. The front wheels are 8 in. in width and set outside of the drum's path, so that, in advancing, the machine rolls a 70-in. strip of ground. There is direct transmission of power to the pulley, which drives a belt at a speed of 2,600 ft. a minute. The turning radius of the tractor is 10 ft. and its weight approximately 5,200 pounds. The entire machine is protected by a corrugated sheet-metal cover that follows the contour of the drum at the rear.

TENTS MOUNTED ON SKIDS SPEED HIGHWAY WORK

Four tents, mounted upon skids for the sake of extreme portability, were used to facilitate construction work on the section of the Lincoln Highway crossing the Great Salt Lake desert in Utah. The construction crews made rapid progress over



Tents, Most Portable of All Shelters, were Made Still More Mobile by Mounting Them on Skids, to Speed Construction Work on a Bad Stretch of Lincoln Highway

this difficult ground, and the skidded tents were moving forward a good part of the time. Two 400-ft. stretches of desert right of way were so bad that a corduroy foundation had to be laid before the grade could be constructed.

ELECTRIC-RADIATOR HEAT MADE SELF-ADJUSTING

An electric current through a thermometer column, with an upper contact that closes a relay, automatically opens the main heating circuit when the temperature rises above a desired point. A French inventor provides this means for making the common electric radiator thermostatic, or self-regulating.

MOVIES HAVE RIGHT OF WAY IN LOS ANGELES

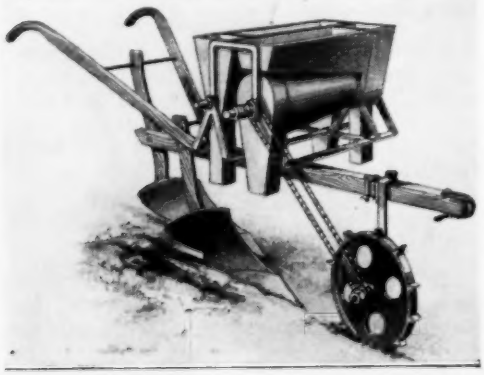
On the streets of Los Angeles, the premier movie city of the world, the motion-picture photographer commands almost as much respect as the traffic officer, or at any rate the public yields to his

A Movie Drama in the Making on a Business Street: A Scene in Los Angeles Showing Traffic Interrupted While a Camera Man, at the Left, Takes Pictures of the Two Actors at the Right

wishes as readily, if the needs of a suitable setting can be supplied thereby. It is not an uncommon sight in the down-town section to see all traffic stopped while actors walk jauntily across a cleared area, acting parts in a scene which will later be fitted into a film drama.

SIMPLE POTATO PLANTER ATTACHES TO PLOW

A comparatively inexpensive potato planter, recently patented, requires the attention of but one man and can be mounted on any suitable plow. It will plant two rows at once, the seed being contained in two troughlike hoppers, from which it flows into two conical revolving drums, placed horizontally. These are situated with their larger, or discharge, ends at opposite sides of the planter so that they can drop seed in parallel rows. The drums are driven by a chain connected with the implement's gearing from a wheel running on the ground. Scoops attached to the large end of each drum inside, pick up the desired amount of seed and elevate it to discharge holes, through which it drops into the furrows. At the small end of each drum is a small hopper equipped with a simple discharge device operated by the drum axle. These hoppers can be used to place fertilizer in the furrow along with the seed.



Potato Planter of Simple Design Which Plants Two Rows at Once: The Seed Passes from the Troughlike Hoppers into the Conical Revolving Drums, from Which It is Dropped into the Furrows at Regular Intervals

DISABLED TOMMIES LEARNING DIAMOND CUTTING

A British diamond corporation has established a diamond-cutting factory at Brighton, England, and has arranged for instruction centers in various parts of the country where disabled soldiers can learn how to transform rough diamonds into finished gems. Before the war practically all of the British diamond output, which means practically all of the world's output, was shipped to the continent of Europe to be polished. Proprietors of the new factory already employ several hundred ex-fighters and claim to have proved that they can do as good work as the men on the continent who devoted their lives to the diamond-cutting trade.

STREET PAVEMENT YAWNS AND SWALLOWS CAR

During a recent heavy rain a considerable area of a well-paved Philadelphia street suddenly caved in, swallowing a heavy touring car which had just stopped at the curb. The owner of the car stepped from it only a few seconds before it dropped into a hole 30 ft. deep. The collapse of a 14-ft. brick sewer, flooded beyond its capacity, was the cause of failure of the pavement. A second heavy storm immediately following brought another rush of water through the broken drain. Although a guard was promptly thrown about the opening, the car, which was lying on its side in the crushed sewer, entirely disappeared without leaving a trace either in the sewer or in the creek which receives its outflow.

This Yawning Pit Appeared in a Philadelphia Street So Suddenly That a Car at the Curb was Engulfed a Few Seconds After Its Owner had Stepped Out. Heavy Rains, Flooding the Large Brick Sewer Whose Broken Arch Is Visible in the Picture, Caused the Collapse

This Picture was Taken a Short Time After the Street Caved In, and the Automobile Which Fell into the Hole, 30 Feet Deep, is Seen to be Lying in the Débris of the Broken Sewer. After Another Flood had Swept Down the Sewer a Little Later, the Car Entirely Disappeared, and a Thorough Search of the Sewer and Its Outlet Failed to Discover Any Trace of It

GREAT EFFICIENCY CLAIMED FOR INVERTED DRILL

Conventional ideas have been completely disregarded in designing a power drill which bores upward instead of downward, and which the makers claim effects a 50-per-cent increase in the speed of operation, owing to the fact that the borings fall out as fast as they are cut. The work is forced down onto the drill automatically by a lever placed almost horizontally above the machine and having weights at one end. When work has been properly placed one operator can look after several of these drills at once. When the drill breaks through, a spring cushion at the top of the spindle checks the force of the blow and so prevents breakage. This drill press is built particularly for work on articles of steel, brass, or cast-iron and has been submitted to practical tests.

THE ROSELLE, A NEW RIVAL OF THE CRANBERRY

An industry as yet little known in this country, but one which seems destined to attain considerable magnitude, particularly in southern California and Florida, is the growing of the roselle, a tropical plant from parts of which are made jams and jellies closely resembling those made from cranberries. The roselle is a native of the old world, is an annual, and attains an average height of six to eight feet. The plant is ornamental and bears large yellow flowers, each with a dark red eye. The calyxes of the flowers, which mature about three weeks after the latter open, are the parts gathered for marketing, being cut from the bushes with a sharp knife. In California the harvest time extends from late August until the coming of frost, while in Florida it is somewhat later in starting. If the calyxes are gathered at the proper time, new flowers appear in rapid succession, so that the average yield from a plant is five to six pounds. In recent years the roselle has been extensively cultivated in Australia, particularly Queensland, and it has long been grown in India for its fiber which is used a great deal in making cordage

PHOTOS BY ROBERT W. HODGSON

Boxes of Roselle Calyxes, Which are Made into Jellies and Jams Like Cranberries, are Shown at the Left. In the Circle, a Picker is Gathering This "Fruit." A Typical Plant is Shown at the Right with a Blossom About Midway up the Stalk

and coarse textiles. Growers are advised to cultivate about 680 plants to the acre. As yet the market for this product is limited, but the retail prices range from 10 to 15 cents per pound. The plants are quite hardy and not subject to many pests.

CHINA'S ANCIENT GRAND CANAL TO BE MODERNIZED

Preliminary work is about to begin on the modernizing of China's Grand Canal, an ancient waterway 1,000 miles long, extending from Hangchow, on the south, to Tientsin, on the north. One portion of the canal is 2,400 years old, and another section more than 1,000 years old. Some of the most primitive locks in the world are still in use along this route. The Chinese government has appropriated $6,000,000 with which it is proposed to modernize about 100 miles of the canal and reclaim some thousands of acres of fertile land, now useless because swampy or under water. An American engineer will have general charge of the work, while operating under him and associated engineers will be a number of young Chinese, many of whom have obtained their technical training in the United States. If the task now about to be undertaken results in all that is promised, it is believed that the Chinese government will not hesitate to make additional appropriations for more extensive improvements.

GOLF CLUBS WITH SHAFTS OF STEEL

Of special interest to golf players is a club made with a steel instead of a hickory shaft, which, it is claimed, possesses all the flexibility of the wooden shaft and has additional desirable features. The steel shaft is hollow, tapers toward the lower end, and is much smaller in diameter than one of hickory. This is said to give the player additional driving power, because of reduced friction when the club is swung through the air. The head is so mounted as to avoid any unpleasant jarring of the hands when the ball is struck. All types of clubs are to be made in this manner, and at a cost somewhat lower than those with hickory shafts.

ACCIDENT ENDS BALLOONIST'S PARACHUTE JUMP ABRUPTLY

Quite a thrilling mishap was experienced recently by an army balloon observer at one of the western training

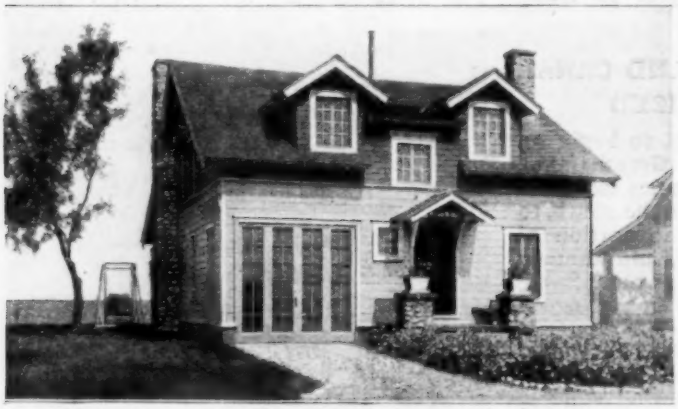
Dangling Helplessly in the Cordage of a Second Parachute, the Soldier was Hauled Down, None the Worse for His Experience

camps, when he attempted to make a parachute leap from an elevation of 3,000 ft. As he dropped over the side of the basket, he became entangled in the cordage of another parachute that was folded in a case fast to the craft. A second later, instead of shooting earthward through the air, he was dangling, head down, a helpless captive in mid-air. The fact that the jump was attempted from a captive balloon undoubtedly saved the soldier's life, for he was quickly hauled down, uninjured.

¶ Hereafter all post offices will act as information centers for directing discharged men to the nearest soldiers' and sailors' bureau. These bureaus are being established throughout the country by the United States Employment Service, in coöperation with various local and national organizations.

COMBINE HOUSE AND GARAGE WITH PLEASING EFFECT

Many attempts to incorporate a garage in a modern house have left much to be desired in the way of architectural effect. Such a dwelling as is shown in the accompanying illustration, therefore, attracts favorable interest because of the architect's happy solution of his problem. Artistic doors, made like French windows, afford ingress to the garage at the left of the dwelling entrance, the exterior appearance suggesting a sun parlor rather than a motor-car shelter.



A Lakeside Cottage in Which a Garage has been Incorporated in a Way That Is Unusually Pleasing: The Long Glass Doors Suggest a Conservatory or Sun Parlor, Rather Than a Garage

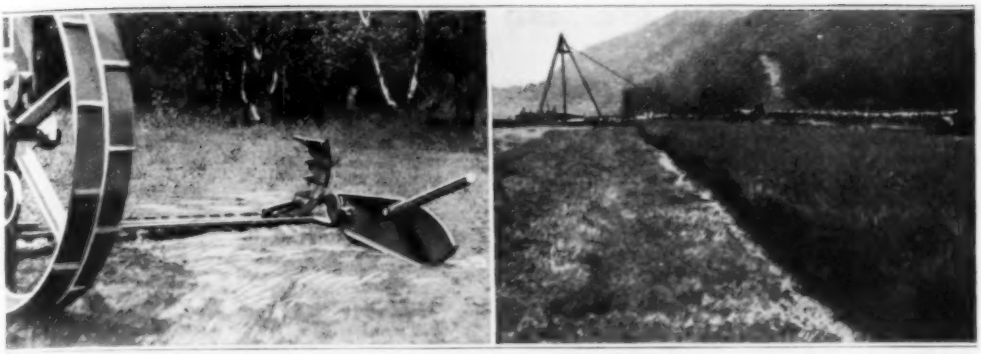
ELECTRIC AND STEAM POWER FOR BLAST-FURNACE BLOWER

In constructing a special blast-furnace blower recently, provision was made against interruption of operation in the event of failure of the electric current for any reason. Normally, motive power is supplied by a synchronous motor, while in an emergency a steam turbine is employed. The interesting point is that the change from the one to the other is made automatically. Air pressure keeps a balanced valve in the steam-supply pipe closed, and the turbine idle. The instant, however, that the electric current fails, the air pressure from the blower drops and the steam valve opens, starting the turbine. As soon as the blower and turbine shafts attain the same speed, the clutch between them engages and that between the motor and blower disengages. This change from electric to steam power takes place quickly and so smoothly that it is said to be nearly impossible to detect the moment of engagement.

WALL BUILT OF SAMPLE BRICK COSTS LITTLE

Evidence of thrift and public spirit on the part of municipal employes is found in an artistic brick wall, erected at the end of a blind street in Cincinnati, which spot was the scene of several accidents before this barrier was erected to mark the end of the thoroughfare. The wall was built by the city engineering department at a cost of only $219. Had all the materials and labor been paid for at regular rates, it would have cost about $1,200. The saving was made possible by using samples of brick and cement which had been submitted to the department for tests, including the use of a "rattler" for the bricks. The fact that the rattler nicked off the corners of the brick did not detract from their usefulness. The wall was built largely by department employes when other work was slack. It served as a barrier between the end of the street and a ditch skirting a railroad right of way. At either end were footbridges crossing this ditch.

Ornamental Brick Wall Marking the End of a Blind Street in Cincinnati: It was Built at Small Cost by the City's Engineering Department with Samples of Brick and Cement Submitted for Test Purposes



Left: A Mower with a Curved Extension Attached to Its Cutting Bar for Use in Alfalfa and Other Crops That Become Badly Tangled. The Manner in Which This Device Completely Separates the Cut from the Uncut Material at the Edge of a Swath is Shown at the Right

ATTACHMENT FOR MOWER CUTS EDGE OF SWATH CLEAN

In using an ordinary mower to cut alfalfa, clover, and similar crops, difficulty is experienced because at the edge of each swath part of the cut material remains tangled with that which is uncut, rendering it necessary to make allowance for this strip. One of the simplest devices designed to remedy this condition consists of an extension of the cutting member attached to the outer end of the latter. This attachment curves upward so that it completely separates the newly cut swath from the uncut material. The blade is of thin steel and moves back and forth in its sheath without difficulty. The extension tends to throw the cut material at the edge of the swath toward the machine, leaving a path of clean stubble adjoining the standing crop, along which one of the horses can walk.

CONCEALED SPRING DOES WORK OF FOOT MUSCLES

For the benefit of the patient who has lost control of the forward portion of either foot, a special spring, less conspicuous than apparatus used heretofore, has been devised to hold the member up, automatically. It consists of a piece of steel shaped like an interrogation point attached to levers which are in turn fastened to the shoe and to a band about the calf. The apparatus is practically all concealed beneath the trouser leg.

BORDEAUX NOW HAS STATUE OF LIBERTY

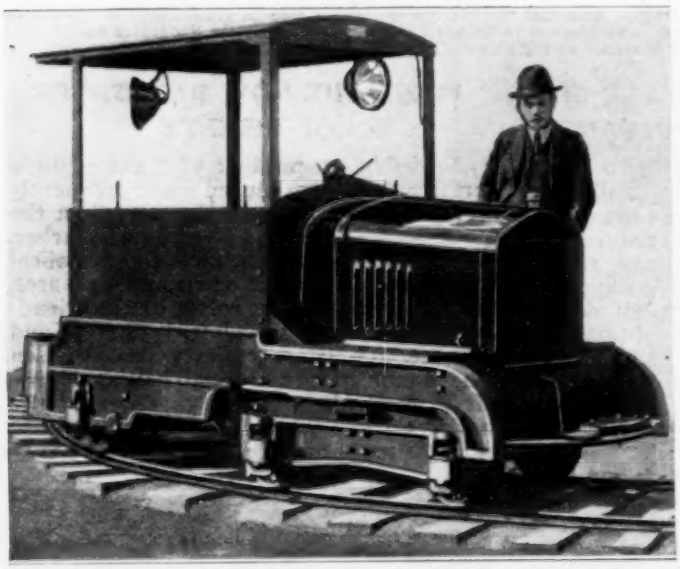
Probably no product of the sculptor's art has been reproduced more frequently since America entered the war, than the Statue of Liberty in New York Harbor. Certainly no other statue is so symbolical of America's present spirit and purposes, nor is there a better token of the friendship between the United States and France, the latter country having been the donor of the original bronze figure. It is particularly fitting that one of the many replicas which have been set up in various parts of the world should be conspicuously located in Bordeaux. To the thousands of American soldiers passing through that city it is a happy reminder of the homeland.

Small Reproduction of the Statue of Liberty, Unveiled Recently in Bordeaux, France: To the Thousands of American Soldiers Now Frequenting That Port It Is a Happy Reminder of the Homeland

LIGHT MOTOR-CAR PARTS USED IN BUILDING LOCOMOTIVE

Of the numerous types of self-propelled vehicles that owe their existence to a certain ever-present model of light motor car, perhaps none is more interesting than an industrial locomotive of current development. The latter is a hard-working little machine of 30-in. gauge and 4,000-lb. weight, that exerts a drawbar pull of 500 or 600 lb. and is especially adapted for moving a train of a dozen or more one-ton ore cars at a mine, or pulling material or dump cars at a construction site. The front end, where the familiar radiator and hood are mounted, is practically the only outside part suggestive of the automobile. Beneath the hood is the small motor, which gives the locomotive a speed of 10 miles an hour. Its power is transmitted to a countershaft connected by chains to the drivers. The latter, two in number instead of the usual four, are of 12-in. diameter and bear 2,400 lb. of the weight. In addition to the regular transmission, there is a special reversing mechanism that gives the locomotive the same speeds rearward as it has forward.

A pony truck at the front is held in place by a king-pin, and a seven-foot radius curve can be negotiated with ease. Over all, the locomotive, which is not intended for underground operation, measures about 10 ft. The top of its cab is six feet above the rails. The driver is provided with a seat of the farm-implement type, before which is the motor-car steering column with spark and gas levers, but minus the unnecessary wheel. Other models of the locomotive are built with gauges of 18 and 36 inches.



This 4,000-Pound Industrial Locomotive, Designed Especially for Moving Trains of Ore Cars at a Northern Mine, Constitutes an Interesting Illustration of a Well-Known Light Motor Car Adapted for Rail Work. Its Gauge Is 30 Inches and Its Operating Speed 10 Miles an Hour

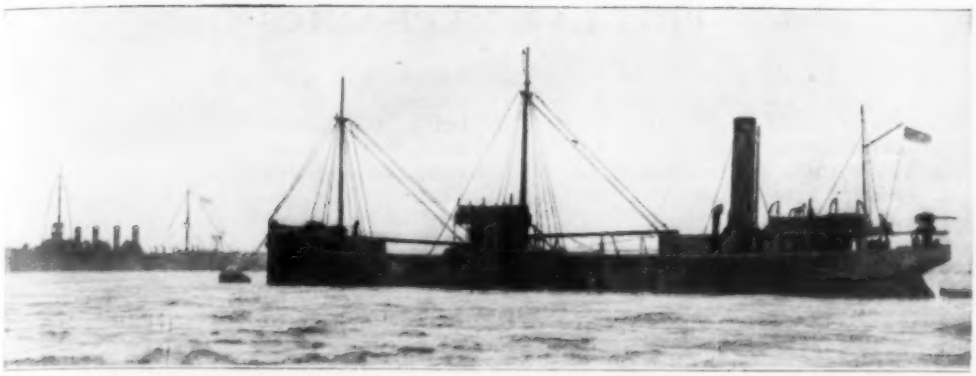
SUBMARINE NEST REVEALED BY AMATEUR SNAPSHOT

Certain dark and mysterious spots in a photograph left for development in a shop in a small English coast town led to a reprimand and a $250 reward for the lady whose amateur camera made the exposure. The astute shopkeeper, when he observed the strange spots coming up in the developer, forwarded the plate to the British Admiralty. The shadowy images turned out to be German U-boats lying in the creek, whose beauty had induced the amateur to break the English war rule against photographing.

The whole nest of enemy submarines was promptly captured, betrayed by one of those occasional optical freaks which record on a plate objects invisible to the eye. The British Admiralty had known of the U-boat nest, but all efforts to locate it had been unsuccessful, though the photographic method had been tried several times.

LIGHTNING LOSES TERRORS IN ITALIAN BALLOON

So constructed that no metal surfaces or parts whatever are exposed, a new type of observation balloon used by the Italian army is enabled to stay up during electrical storms without special danger to its occupants. The observer's basket communicates with the crew on the ground by wireless telephone. Unusual stability and lifting power are other characteristics of the new type, one of which rose to the record height, for an observation balloon, of 16,000 ft. above London.



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H. M. S. "Suffolk Coast," One of the Royal Navy's Tramplike Q-Boats That Plied the Trade Routes and Decoyed Hun Submarines to Encounters of a Type for Which They Had Little Taste

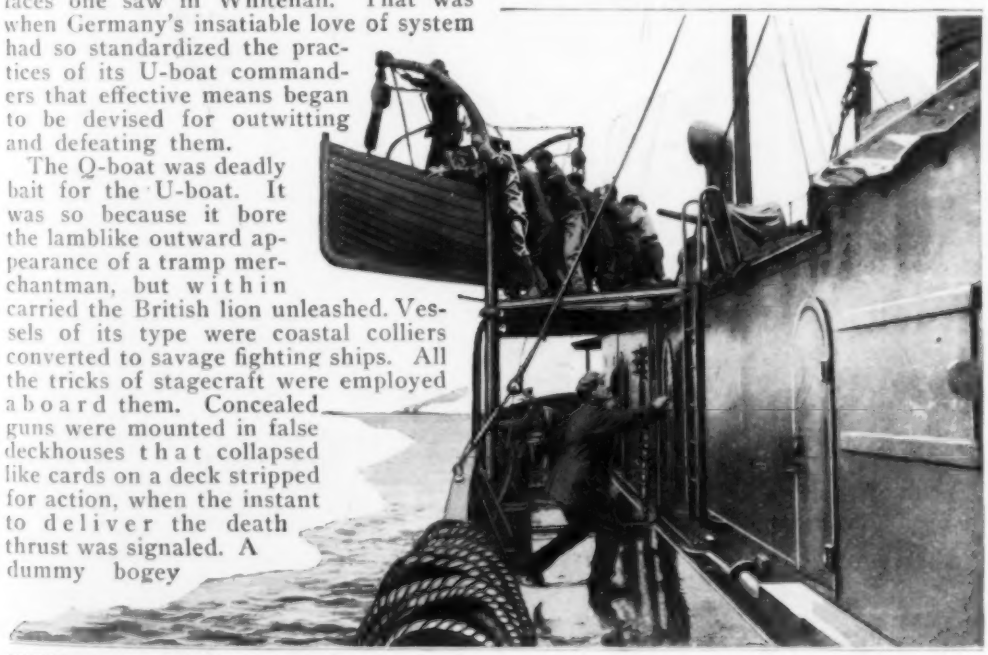
DARING Q-BOATS UPHELD ROYAL NAVY'S TRADITION

MANY chapters of romance were added to the lore of the British Navy during the grave days of the world war, and prominent among them is one that concerns the adventurous exploits of the heretofore unmentioned Q-boats, as strange craft as ever fought an unscrupulous foe.

Britain's Q-boats haunted the trade routes and preyed upon the "hell-divers" of the Hun. They were conceived, fashioned, and sent to sea when the weekly reports of sinkings were as serious as the faces one saw in Whitehall. That was when Germany's insatiable love of system had so standardized the practices of its U-boat commanders that effective means began to be devised for outwitting and defeating them.

The Q-boat was deadly bait for the U-boat. It was so because it bore the lamblike outward appearance of a tramp merchantman, but within carried the British lion unleashed. Vessels of its type were coastal colliers converted to savage fighting ships. All the tricks of stagecraft were employed aboard them. Concealed guns were mounted in false deckhouses that collapsed like cards on a deck stripped for action, when the instant to deliver the death thrust was signaled. A dummy bogey funnel in the forecastle head covered a periscope for the captain's use when below. A hidden hatchway communicated with the bridge.

From stem to stern a Q-boat was a masterpiece in camouflage. Its crew, uniformed in the indiscriminate attire of rowdy "hands," was the slovenly crew of a rat-laden tramp—to the Hun. In stricter conformity to fact, however, the men were "hand-picked" from the personnel of the Royal Navy; as fearless and alert a crew as ever breathed salt air. Their assign-



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The "Panic Crew" Played an Important Part in the Q-Boat's Drama of Camouflage. While Hidden Gunners Prepared for Action, These Men Fought for Places in the Small Boats, Some Even Diving Overboard

ment was the daring one of decoying "steel sharks" and "harpooning" them, which often meant first being a target for torpedoes. More than unfearing Jacks were these men, for fully half of their number were actors also, who performed the most singular of dramas. These particular seamen composed what was known as the "panic crew." Their part in decoying the dangerous prey was to enact a scenario that was rehearsed many times before being staged for a German audience.

One of the many interesting experiences of the Q-boats serves well to narrate the story of how they fought. Picture a ship that carried aboard a swarthy, big-jointed sailor togged in skirts and lolling in a deck chair on the poop. Fancy a green parrot tied in a cage that hung where its guardian might reach it conveniently when responding to his cue. Think of a ship sailing the merchant lanes for months, offering itself as a target to hidden foes in order that it might fight, even though crippled first. And then imagine the foaming wake of a torpedo suddenly extended across its path shortly after dawn on a fine spring morning.

Outwardly the tramp held to its course and observed nothing. On board the man-of-war, however, a long-awaited alarm rang clearly and men crawled to battle positions. Presently a submarine broke the surface several hundred yards away and fired across the tramp's bow. That was the signal for the curtain to be run up on the strangest of war dramas. The engines were stopped, steam poured from the exhausts, and the ship rocked in the trough of the waves. The panic crew became "hysteric." On the bridge the captain executed the gestures of a slap-stick comedian and roared order after order. In a riot of apparent confusion, the panic crew raced to the small boats. The U-boat, meanwhile, approached at top speed and fired another shell that missed the ship's vitals by a few yards.

The single blast of a whistle blown by the captain was the signal to cease acting and begin fighting the decoyed submarine, which had now come sufficiently close to be a good target. In immediate response the white ensign of the Royal Navy was run up. A lever was jerked and the false deckhouses collapsed, exposing heavy rifles and machine guns in charge of eager and expert crews. In less than three minutes from the time the commander issued the order to lie to and fight, a hit was registered that foundered the U-boat.

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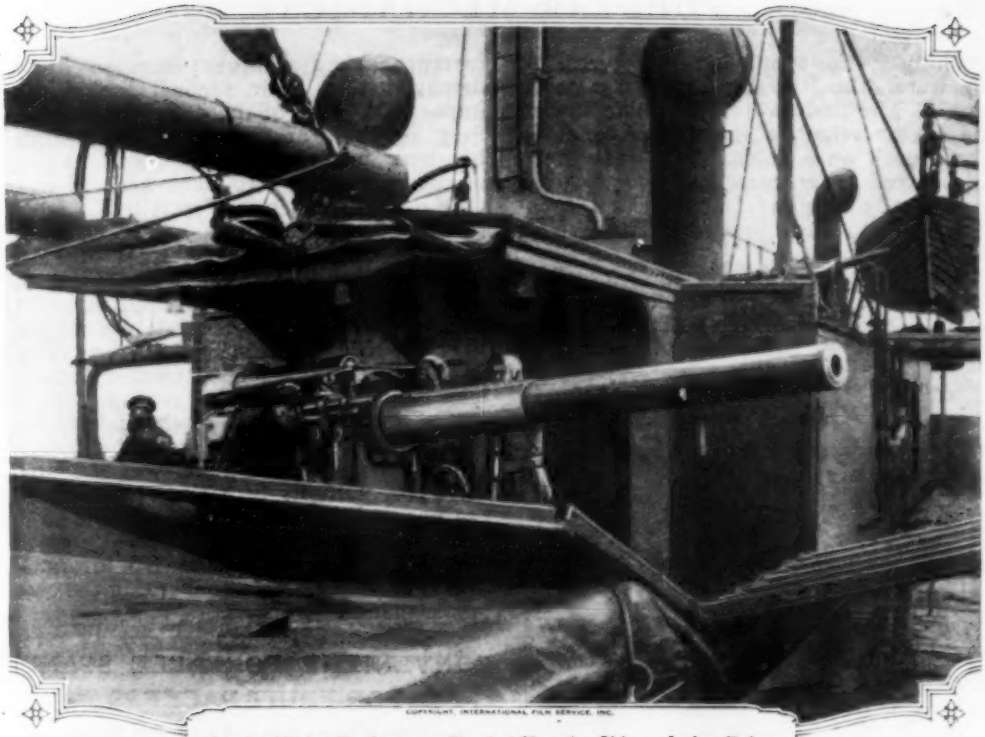
Not a Natty-Looking Crew from the Standpoint of Uniforms, but a Nervy Lot of Seamen, "Hand-Picked" from the Royal Navy's Personnel for Q-Boat Service, Here Shown aboard the "Suffolk Coast," One of Several Ships They Manned in Their Adventurous Campaign against U-Boats



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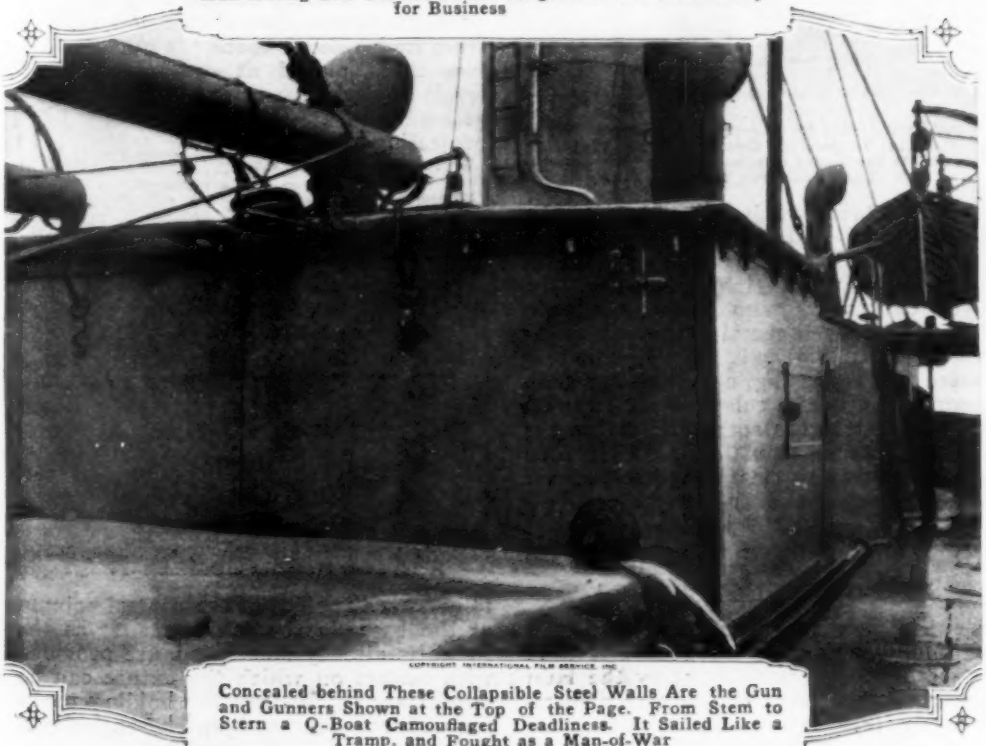
As the White Ensign was Hauled Up, the Sides of the False Deckhouse Collapsed Like Pasteboard Cards, Disclosing a Big Hun-Hating Gun Trained on Its Target and the Crew Ready for Business



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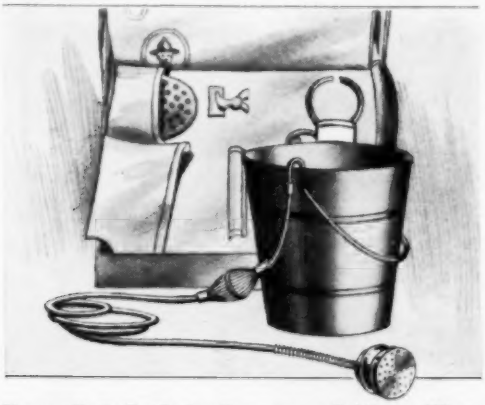
Concealed behind These Collapsible Steel Walls Are the Gun and Gunners Shown at the Top of the Page. From Stem to Stern a Q-Boat Camouflaged Deadliness. It Sailed Like a Tramp, and Fought as a Man-of-War

Dashing to the spot where oil spread on the water, the Britisher dropped a depth bomb. The underwater explosion hurled the enemy vessel to the surface, end up, like a cork on a fishing line. The stern rifle blazed again, mercilessly perforating the already helpless "sub," which presently sank to Davy Jones's locker with all hands.

A shout went up from the victorious man-of-war. A moment later the ship steamed ahead in search of further prey.

COMPACT SHOWER BATH FOR CAMP USE

The luxury of a shower bath can be enjoyed by a soldier or camper by using



Shower-Bath Outfit for Campers or Soldiers: When the Pail is Suspended Overhead, the Water is Siphoned to the Spray Nozzle. One or Two Squeezings of the Bulb will Start the Flow

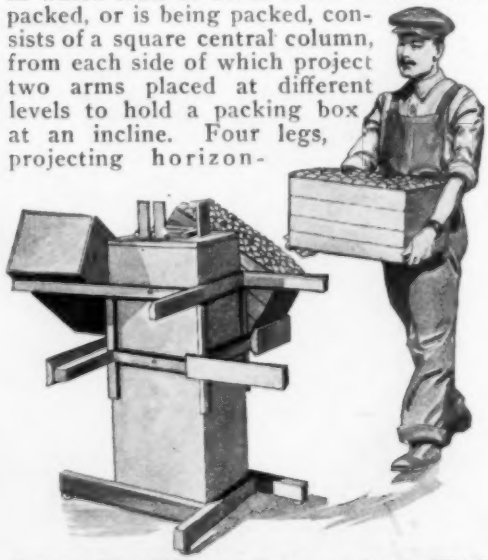
a new portable outfit connected with a pail of water, suspended 6 or 7 ft. above the ground. It consists of a rubber tube which serves as a siphon, and has the lower end fitted with a spray nozzle, while a U-shaped metal section fits over the edge of the pail. The siphon is started by squeezing a collapsible bulb incorporated in the tube. A wire handle that attaches to the spray end makes the latter easy to manipulate. Also included in the outfit are a clamp for shutting off the water, and a rubber sponge.

BIG GERMAN BOMBERS MOUNTED FIVE AND SIX ENGINES

Several new types of giant multiple-motored bombing planes were placed in service on the western front by the Hun during the last days of the war. Specimens of two interesting models were felled within the allied lines, but in all instances the machines were so badly damaged that their reconstruction was impossible. One of these planes mounted four engines, and another, five, while bombers propelled by as many as six motors are known to have been in use. One of the four-engine craft had a wing spread of approximately 140 ft. Its six-cylinder motors, giving a total of 1,200 hp., were mounted in pairs, placed end to end on each side of the fuselage and well forward, so as to concentrate the weight near the main plane's leading edge. The two front motors turned tractor propellers, while those in the rear, equipped with flywheels and driving through shafts and reduction gears, each worked a pusher screw. A five-motor plane was similarly arranged, with its fifth engine placed in the nose of the body and connected to a tractor propeller. Its combined horsepower amounted to 1,500. No information is as yet available concerning the six-motor planes.

CONVENIENT PORTABLE STAND FOR FRUIT PACKERS

A convenient wheeled support for boxes in which fruit or other material has been packed, or is being packed, consists of a square central column, from each side of which project two arms placed at different levels to hold a packing box at an incline. Four legs, projecting horizontally from the sides of the central column at the base, in the same manner as the supports already mentioned, are provided with casters on which the fixture can be moved about. A tray for holding packing paper is mounted on the top of the stand.



Packer's Wheel-Mounted Truck, or Stand, Which Holds Four Boxes at a Convenient Angle

AMERICAN PHOTOGRAPHERS MAKE RECORD IN EUROPE

Although they were seriously handicapped by the lack of accommodations, the American Photographic Force distinguished itself and accomplished a record task when it turned out 9,000 prints in 16 hours during the offensive in the Argonne district. Altogether, over 100,000 prints had to be finished in four days, most of them having been taken by French airmen. After traveling all night to reach their headquarters, the Yank photographers proceeded to convert a dilapidated brewery shed into a dark room, and an hour later had started their sleepless job. All the water for the work had to be carried some distance in buckets.

While most of the regular photographic planes were employed in observing and directing artillery fire, several American planes "shot" the results of heavy-artillery fire. The photographs were of greater value than one would realize, as they caught the complete activities at the time and the accurate number of men and guns on the field, and indicated maneuvers that were in progress.

BIG RAFT OF SWEDISH LUMBER MAKES LONG JOURNEY

An immense raft of lumber tied up to the wharf in the harbor of Copenhagen, Denmark, recently, after having journeyed the full length of the Gulf of Bothnia and the Baltic Sea—approximately 1,000 miles. Six months were consumed in making the raft, which was built at Harparanda, a town in northern Sweden, on the Finnish border. It measured 393 ft. long, 57 ft. wide, and 26 ft. high, about three-eighths of its height being visible above the water. A crew of seven men accompanied it on its long voyage.

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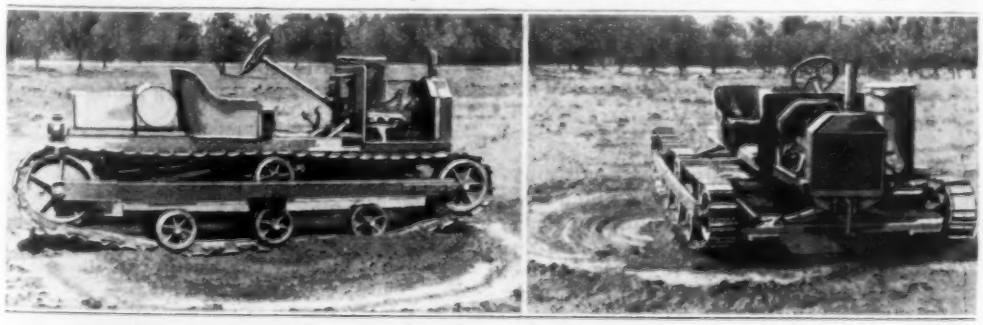
Raft of Lumber, 393 Feet Long and 57 Feet Wide, Which was Towed from the Upper End of the Gulf of Bothnia to Copenhagen Recently

"BABY TANK" USED AS TRACTOR ATTACHMENT

Tractor attachments for light motor cars are more or less familiar as a class, but one such contrivance, originally designed experimentally for war purposes and now assigned to farm work, differs at least from the conventional apparatus.



Ability to Go Almost Anywhere, Economy of Fuel and Oil, Moderate Initial Cost, Easy Attachment and Operation—These Are Some of the Advantages Claimed for the Automobile-Tractor Combination Pictured Above

It consists of a broad frame, supplied with creeper treads, on which a car is mounted after the wheels and front axle have been removed. Driving connection is made through the rear axle. A governor, auxiliary cooling system, and special oiling equipment fit the car for heavy duty. With the attachment, a light automobile is able to handle three 10-in. plows in average soil with ease, and pull other farm implements with equal facility. It turns around in its own tracks like other creeper-tread machines, is able to negotiate almost any kind of ground that is likely to be under cultivation, and maneuvers commendably. Complete, the outfit weighs about 3,000 lb. In width the attachment measures 72 in., while the top of the track is 26 in. above the ground. The combination is said to be economical of fuel and oil.

LONG-SPOUT OILERS PROMOTE SAFETY AND SAVE TIME

In oiling overhead bearings, and others not easily accessible, the use of a stepladder and the danger of accident are alike eliminated by employing an oiler having a spout several feet long. Above the handle projects a pump by which the oil is elevated in the spout, the plunger being operated by pressure of the thumb. Since the spout normally is full of oil, just the amount desired—a drop or a teaspoonful—can be discharged by actuating the plunger. Oilers of this type are made with spouts up to 15 ft. long.

GAS FURNACES MELT METAL WITHOUT CRUCIBLES

Gas furnaces for melting metals without the use of crucibles are a development of the shortage of crucible graphite in Europe. The fuel is gas with a preadmixture of air, which in one plant is introduced at a pressure of 10 to 25 lb. per square inch. For temperatures higher than 1,200° C., the air is preheated. In the ladle type of furnace, the fuel gas is admitted tangentially, usually to two burners, the flow being in a circular direction. In the drum type, the arrangement of the burners and outlets is such that the gases pass through the axis of the drum. Air heaters of gas piping receive the waste gases, using them for preheating the pots which are prepared for the molten metal. Furnaces of this kind have been operated for more than two years without repairs other than the maintenance of the masonry.

SMOKE IN EIGHT COLORS FOR MILITARY SIGNALS

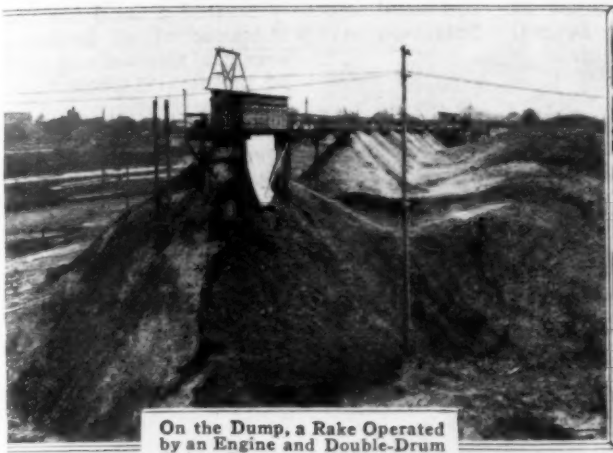
Smoke of eight distinct colors, vivid enough to be identifiable at night, is the product of experimental research work undertaken by an American army chemist. Colored-smoke signals are largely used in aerial bombing operations. The smoke-producing chemical is ignited when the bomb to which it is attached leaves the airplane, fluttering a 30-ft. tail of smoke all the way down and continuing to emit visible vapors for some time. In burning, it gives off light sufficiently brilliant to reveal the color of the smoke column for several miles at night in clear weather, even if dropped in water. This enables the following airplanes to observe the accuracy of the hit and judge the range. Colored smoke had been previously produced by European signalers, but the American army and navy wanted something better and found it.

QUICK-ACTING CRANK-OPERATED OIL AND GREASE GUN

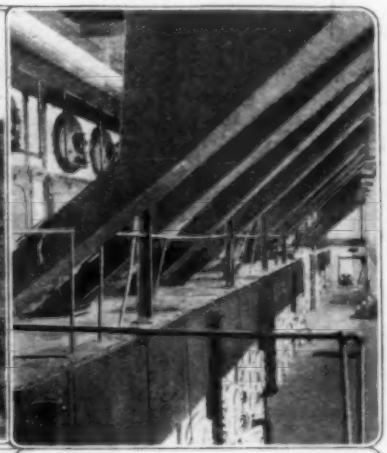
For motor-car use, a quick-acting grease and oil gun of moderate cost with all moving parts inclosed, making it a clean apparatus to handle, has been introduced. It is a crank-operated, gear-action, rack-and-pinion implement that discharges 20 oz. of lubricant with each stroke. In overall length it measures 31 in., while its weight amounts to 9 lb. The barrel is made of seamless steel tubing and supplied with a self-acting tension plunger that will load and discharge heavy or light lubricants with equal facility.

The Gun is Stanchly Constructed to Withstand Rough Usage

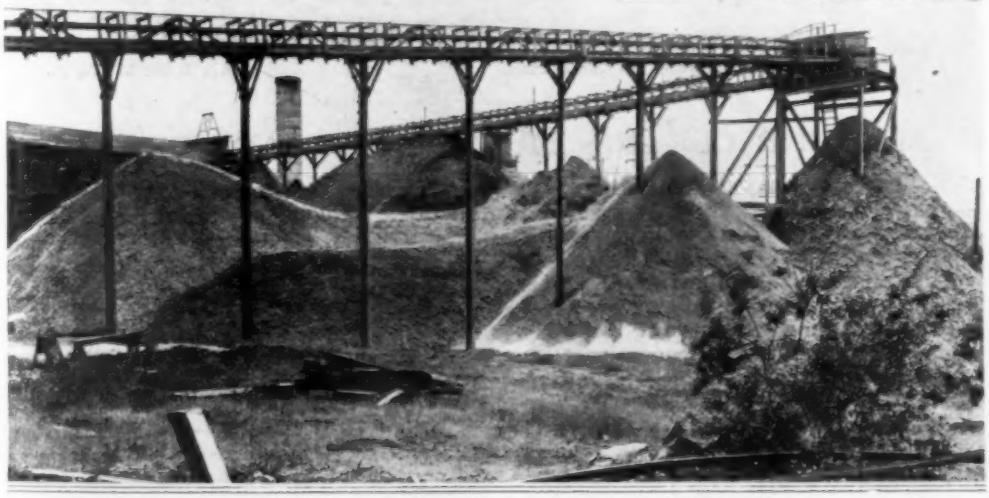
SAWMILL WASTE USED IN WESTERN POWER PLANTS



On the Dump, a Rake Operated by an Engine and Double-Drum Hoist Drags the Refuse from the Center Line to the Peak at Each Side of the Conveyor Structure



No Difficulty is Encountered in Firing with Mill Waste, for Conveyors Deliver It to Chutes, Which Feed It to the Furnaces as the Picture Above Illustrates



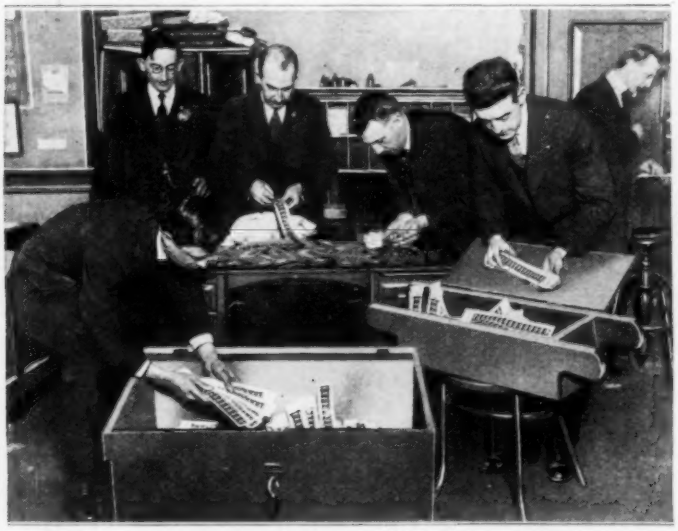
View of a Sawmill Dump Showing a Veritable Foothill of "Hog" Fuel, as the Waste is Known to Millmen, Gradually Building: As a Coal Substitute, This Material is Used Successfully by a Western Power Company

Practice has proved that sawmill refuse is a satisfactory and economical coal substitute for power plants advantageously situated. During the low-water season last summer two auxiliary steam plants of a street railway, light and power company in the Northwest were operated at full capacity with the so-called "hog" fuel. One of the plants, during the three-month period it was in use, generated 4,500,000 kw.-hr. of electricity. Under favorable conditions, it is understood, 200 cu. ft. of the material will develop enough steam for the generation of about 400 kw.-hr. of energy. In using the waste for fuel purposes, chain conveyors are employed to carry it from large dump hills to chutes, through which it is fed to furnaces. Fires are easily kept banked. By use of forced draft, intense heat is produced quickly in the event of an emergency requiring rapid generation of steam.

¶American methods of canning, introduced by missionaries, are now popular in the households of India.

GIVE MILE OF PENNIES TO SALVATION ARMY

The employes of the customhouse at New York, of whom there are several thousand, recently started a fund for the Salvation Army because of its overseas services, and set one mile of pennies as their goal. All contributions were exchanged for pennies at the subtreasury, and the copper coins were then inserted in 1-ft. paper strips prepared for the purpose, each strip having a capacity of 16 cents. In all, 5,280 strips, or $844.80 worth of pennies, were needed to complete the mile, but it was expected $1,000 worth would be received.



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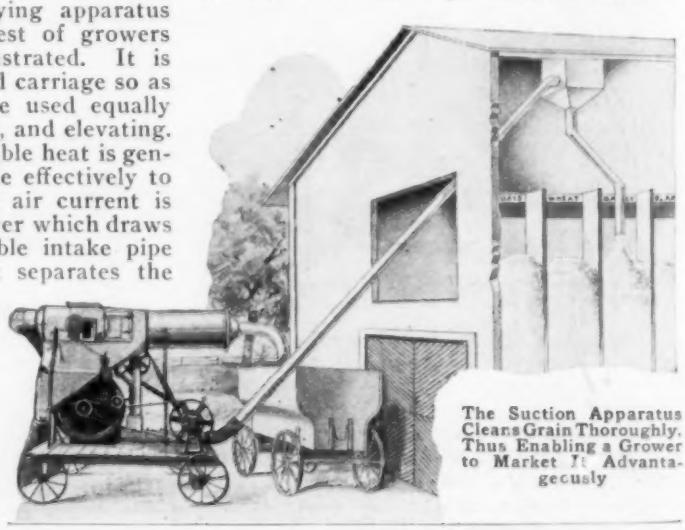
A Mile of Pennies for the Salvation Army, the Gift of New York Customhouse Employes: The Coins were All Placed in One-Foot Strips Containing 16 Cents Each

¶An English concern has placed on the market a selection of tweeds which are hand-woven by disabled soldiers and sailors, each piece being marked with the name of the man who wove it.

MACHINE CLEANS, DRIES, AND LOADS GRAIN

Among the farm implements that nave been developed lately, there is a suction grain-cleaning and conveying apparatus that has drawn the interest of growers who have seen it demonstrated. It is mounted on a four-wheeled carriage so as to be mobile, and may be used equally well for loading, unloading, and elevating. Through friction considerable heat is generated, and this tends quite effectively to dry wet grain. A strong air current is developed by a rotary blower which draws the grain through a flexible intake pipe to a revolving sieve that separates the chaff, dirt, wild oats, mustard and pigweed seeds from it. The impurities are discharged through a chute to a sack, while the grain, cleaned and dried, is elevated to storage bins, or loaded into a wagon or car, as circumstances dictate. As is well known, grain is purchased according to its grading, so that clean grain commands a better price than that which contains chaff and weed seeds. For this reason the machine, which performs its several functions in one operation, enables a grower to market his grain advantageously. The machine is operated at moderate cost, and is supposed to pay the large grower generous profit.

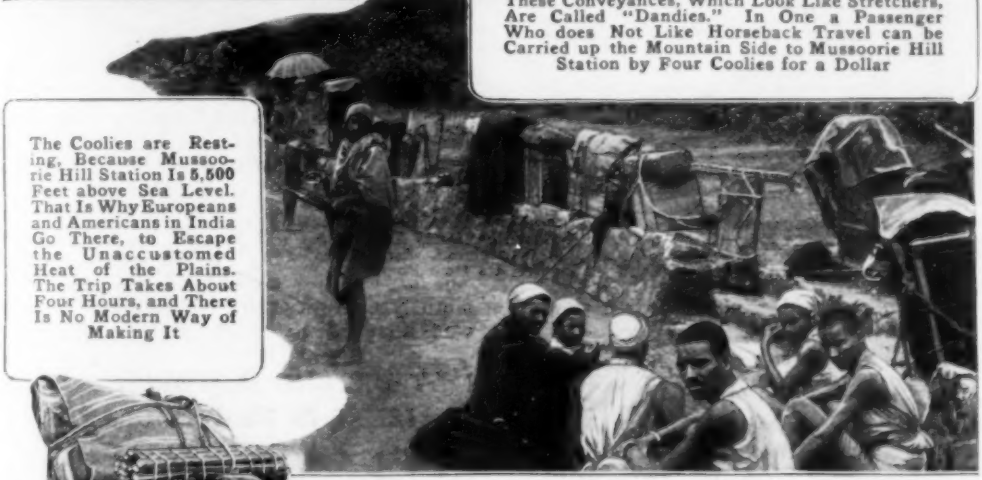


The Suction Apparatus Cleans Grain Thoroughly, Thus Enabling a Grower to Market It Advantageously

TO INDIA'S SUMMER RESORT BY PRIMITIVE MEANS

These Conveyances, Which Look Like Stretchers, Are Called "Dandies." In One a Passenger Who does Not Like Horseback Travel can be Carried up the Mountain Side to Mussoorie Hill Station by Four Coolies for a Dollar

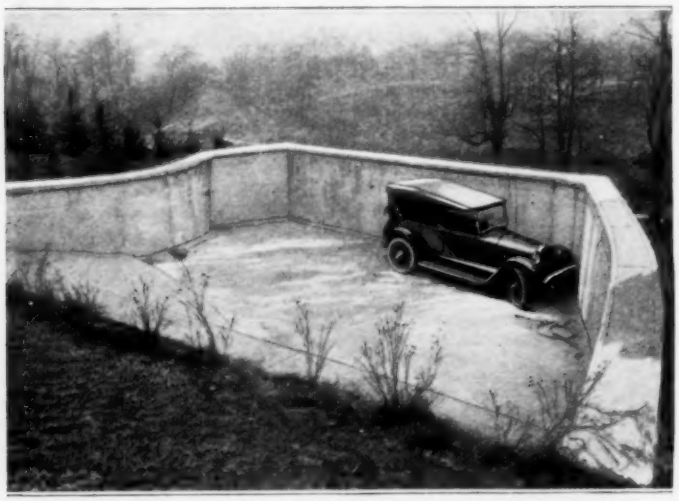
The Coolies are Resting, Because Mussoorie Hill Station Is 8,500 Feet above Sea Level. That Is Why Europeans and Americans in India Go There, to Escape the Unaccustomed Heat of the Plains. The Trip Takes About Four Hours, and There Is No Modern Way of Making It



The Man at the Left is Carrying a Trunk, Bedding, and Other Baggage of a Traveler Who Evidently has Gone Ahead on Horseback. The Other Four Men Have Loads of Coal, Which Is the Only Fuel Used. For Carrying a 200-Pound Load to the Station the Coolies Collect 16 Cents a Trip

AUTO UNHARMED BY PLUNGE INTO CONCRETE TANK

The grounds of a Cincinnati residence were the scene recently of a peculiar automobile accident, which, to the astonishment of all concerned, resulted in practically no injury to the car. In some way the automobile was started down a steep slope back of the residence, and after running 200 yd., plunged into an empty concrete tank, 7 ft. deep, stopping as it struck the far wall. The only damage was a cracked windshield.



Automobile as It Appeared after Its Wild Plunge into This Empty Concrete Tank at the Rear of a Cincinnati Residence: The Walls Are Seven Feet High. The Only Damage Was a Cracked Windshield. An Incline was Installed and the Machine Taken Out on Its Own Power

MANY TONS OF REINDEER MEAT SOLD IN UNITED STATES

The recent selling of 60 tons of dressed reindeer meat in the United States indicates a considerable demand for a food product which compares favorably with beef. According to estimates of Alaskans, there are over 100,000 reindeer in our northernmost territory, and something like five per cent of these are intended for the market. The business of raising them for butchering, in many respects, compares favorably with the raising of other animals, for they live on lichens and cost practically nothing to keep.

¶Ordinary chalk, treated by a new European process, becomes a cheap substitute for cement, strong enough for house-building use. It sets in water and resists the action of moisture.

SNUB FOR SHIP LAUNCHING CHECKS MOMENTUM

Ships launched endwise into a narrow river are in danger of ramming the opposite shore. The workers in an American shipyard operating under such conditions devised a simple method of snubbing the momentum of the ship as it left the ways. On each side of the ways a row of weights was placed along the ground. These weights ranged from two tons near the stern of the ship to 14 tons at the bow, and were separately attached to the ship by heavy iron chains of different lengths. When the ship rushed down the ways one pair of weights after another was taken up, as more and more of its weight floated, bringing it to rest at the desired spot. By slightly changing the weights the system was adapted to ships of different size.

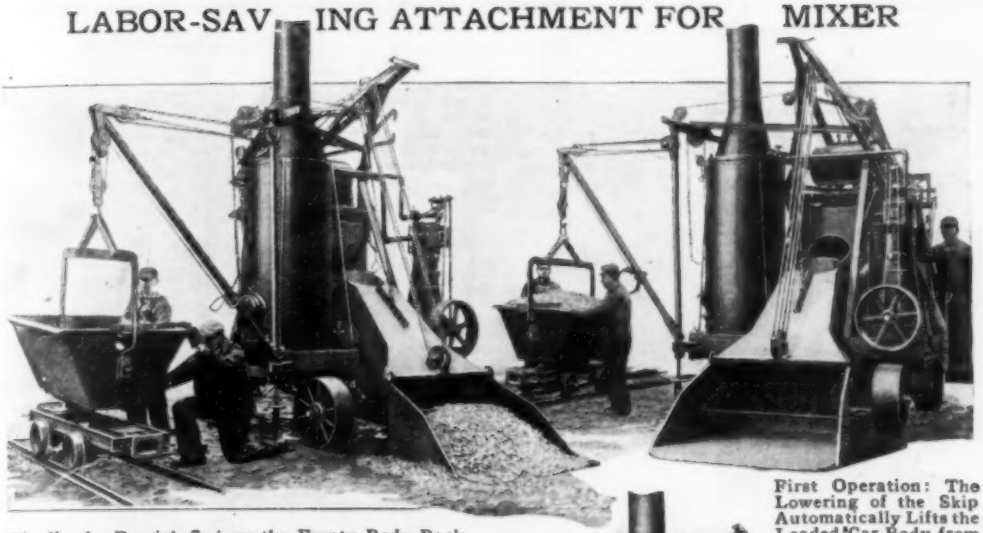
MAY EXTEND MOTORIZED POST LINES IN NEW ENGLAND

In the weeks preceding the holidays, postal officials in a number of New England cities obtained the use of army trucks for carrying package mail between postal stations. The experiment proved so successful in the matter of saving time and labor that further extension of the system may be made. The success of the Portland-New York motorized parcel-post service, established late last summer, has also encouraged postal officials to operate more motor lines.

AIRMAN'S NECK IS BROKEN BUT HE FLIES AGAIN

An American flight lieutenant whose plane fell 800 ft. suffered a broken neck, the fifth and sixth vertebræ being punctured and the fourth and fifth partly dislocated. Treatment for several months at a military hospital and the use of a head-and-neck harness so far restored him that he made another flight as a passenger in a military plane. His ultimate complete recovery is anticipated.

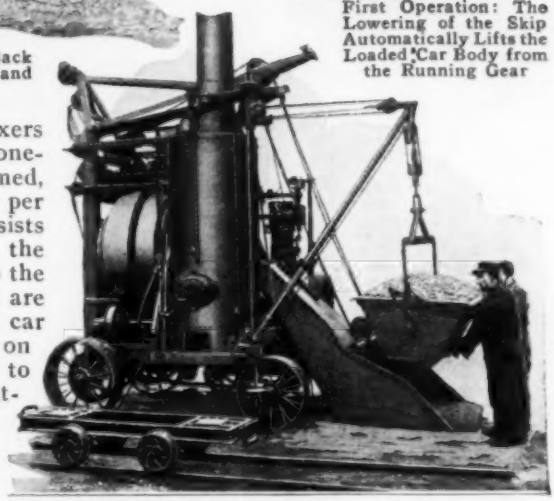
LABOR-SAV ING ATTACHMENT FOR MIXER



First Operation: The Lowering of the Skip Automatically Lifts the Loaded Car Body from the Running Gear

Finally the Derrick Swings the Empty Body Back to Its Truck After the Skip has been Filled, and Another Loaded Body is Brought On

A new attachment for concrete mixers makes it possible to do the work with one-third to one-half less men, it is claimed, and also effects a saving of about 10 per cent in material. The apparatus consists of a derrick and rigging attached to the mixer, for dumping the aggregate into the skip. Where it is used, the materials are poured, in proper proportion, into a car with a detachable body, which runs on a track from a central loading point to the mixer. Arriving alongside the latter, a bail suspended from the derrick boom is attached to the car body. The lowering of the skip automatically lifts the loaded body from the running gear, after which it is swung around and emptied into the skip. As the operator raises the skip, to dump the load into the drum, the car body descends onto its running gear. Thus much labor in handling materials is eliminated, while by carrying them direct from a central loading place to the skip none is wasted on the ground.



In the Second Operation the Derrick Swings the Car Body over the Skip and a Latch on the Bail is Released, Dumping the Aggregate into the Skip

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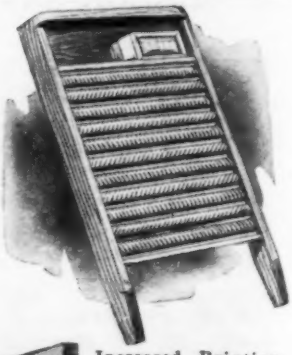
SHIP MORE MEAT TO EUROPE TO SAVE ALLIES' ANIMALS

In order that France, Italy, and the United Kingdom may restore their sorely depleted stocks of native animals, the United States must greatly increase its exportations of meat to those countries, according to Food Administration officials. This will save to these peoples many animals that otherwise would be slaughtered for food. France has lost 17 per cent of its cattle on account of the war, and Italy, 14 per cent. This is serious, not only because of the meat involved but also on account of the lessened supply of milk and the need of the cattle as draft animals. The United Kingdom reports no loss of cattle. The latter country has lost 10 per cent of its sheep and goats; France, 41 per cent, and Italy, one per cent. The number of pigs in France has been reduced 49 per cent, in Italy, 12½ per cent, and in the United Kingdom, 25 per cent. These countries also suffered heavily from other animal losses.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

Laundry Table Supplied with a Folding Clothes Rack and an Ironing Board, Both of Which Are Out of the Way and Concealed from View When Not in Use



Increased Friction without Fatiguing Exertion Is the Purpose of This Washboard, Which is Supplied with 11 Hardwood Rollers Successively Threaded in Opposite Directions

An Inexpensive Gift of Quite Novel Type: A Box of Pine Sticks That Burn with Fragrant Aroma, and a Small Holder for Them

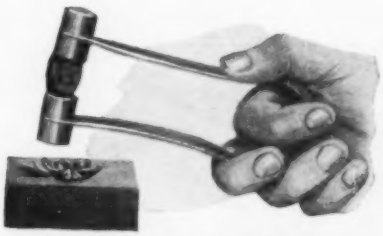
Spring-Balanced Disappearing Apartment Bed That may be Moved Freely to Any Part of a Room, and, When Not in Use, Folded and Concealed in a Closet

Scissors Supplied with a Thimble-Holding Spring and a Marker Fitted in a Hollow Space Formed in the Finger Loop

Commuter's Egg Crate with Outward Appearance of Suit Case, Made in Sizes of from One-Dozen to 15-Dozen Capacity: It may be Folded to Magazine Thickness When Not Filled

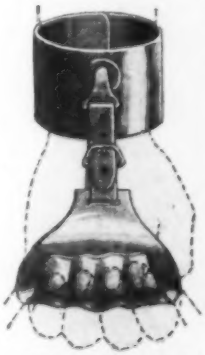
Comfortable Wood and Canvas Outing Chair That Forms a Bundle Only Four Inches Square and 16 Inches Long, When Folded

Serviceable for the Hunter or Camper: An Electric Lantern Supplied in a Compact, Durable Case That may be Conveniently Attached to the Belt



Double-Hammer Cracker That Enables the Kernels of Common Varieties of Table Nuts to be Removed Intact without Appreciable Difficulty

Something New in Men's Neckwear: A Four-in-Hand Tie with Rubber-Fabric Lining Intended to Prevent Undue Wrinkling and Loss of Shape



Grip-Carrying Device Consisting of Wrist Brace Equipped with a Detachable "Hook" Plate That Relieves Strain on Fingers

Comfortable Full-Length Double Bed Suitable for Use in Five and Seven-Passenger Cars: It Rolls into a 25-Pound Bundle, Four Feet Long and Five Inches Thick

Needle and Pincushion Resembling a Small Cactus Plant, Mounted on a Flat Tray That Forms a Substantial Base

Heavy Combination Armchair with Two Extra Seats Arranged to be Folded and Concealed, When Not Needed, in Compartments Provided in Sides

This Leather Wrist Strap with a Cardboard Insert Provides the Golfer with a Convenient Means of Recording His Score

AUTOMOBILE PARTS ARE USED IN FORMING MODEL CANNON

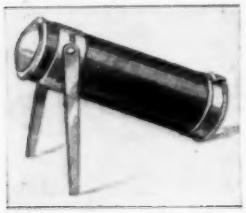
One of the most peacefully inclined artillery pieces in existence is nevertheless an ingeniously constructed bit of mechanism. It is a miniature

This Miniature Model of a Field-Artillery Piece Is an Assemblage of Motor-Car Parts

model of what might pass for a French "75," equipped with special treads and a double limber. More correctly, however, it is a novel assemblage of parts taken from a small motor car.

ATTACHMENT FOR ELECTRIC FLASH LAMPS

A new attachment for an electric torch, or flash lamp, consists of two metal legs pivoted to a collar that fits about the lamp near the bulb end. For such work as repairing an automobile at night, the advantage of a support like this to hold a torch in a desired position, is obvious. When not in use the legs are made to lie close to the lamp casing.



LIBERTY FUEL FAR SUPERIOR TO GASOLINE, IS CLAIM

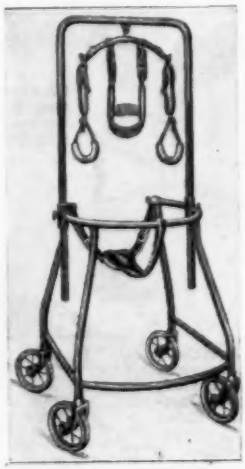
Of extraordinary interest and importance to motorists, and makers and users of internal-combustion engines in general, are the claims made for the new "Liberty" fuel, vouched for by the Division of Research and Development of the U. S. Corps of Engineers. By means of a chemical process, perfected after seven years of experimenting, a fuel having kerosene as its base has been produced which appears to be superior to gasoline in every way. Distillation plays a part in its production, and its quality can be varied to meet the requirements. It is tasteless, colorless, and the products of its combustion are cooler than those of gasoline, hence a smaller amount of lubricant is required where it is used. It is noncorrosive and so less injurious to motors than gasoline. Furthermore, the fuel leaves no residue, and requires no special apparatus, and its explosion effect is 30 per cent greater than gasoline. A spark or flame is required to explode it. Not only can the new fuel be made more cheaply than gasoline, but more of it is obtained from the same quantity of kerosene.

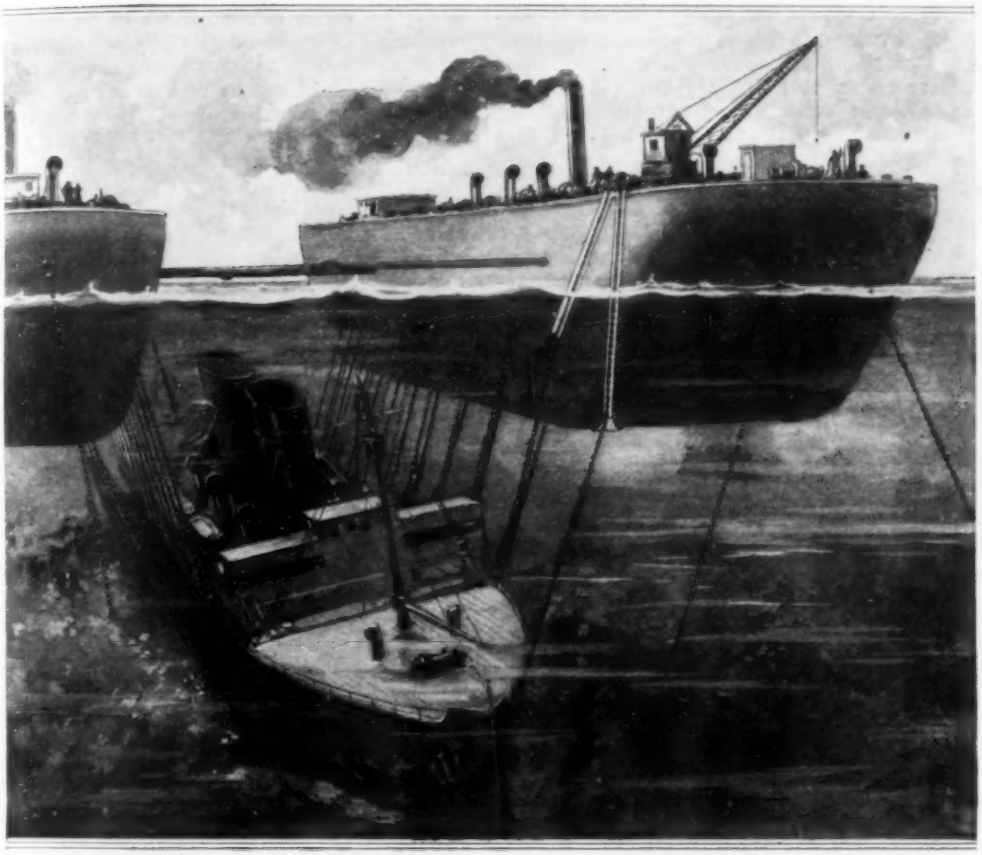
ATTRACTIVE STEEL BOX FOR LIBERTY BONDS

A bond box has recently been put on the market, designed particularly for holders of Liberty, and other, bonds who desire a degree of protection against fire for their securities, but for various reasons do not care to put them in a vault. The box is made of heavy steel, is finished in blue, baked enamel, and is decorated with a patriotic emblem. It measures 11½ by 5½ by 2½ inches.

DEVICE HELPS CONVALESCENTS LEARN TO WALK AGAIN

One of the latest devices that has been brought out for aiding convalescents to regain their ability to walk is an upright frame of steel tubing mounted on four rubber-tired wheels. The lower portion of the frame supports a saddle suspended from straps, while from the upper portion, which is adjustable and arches over the head of the occupant, hang three slings. Two of these are designed to be placed under the arms while the third can be used in supporting the chin.





Chains Passed beneath the Hull, and Others Attached to the Gunwales, Hold the Sunken Ship on an Even Keel While It is being Raised. Booms Hold the Pontoons Apart during the Hoisting Operation

PONTOON HOISTS ARE PLANNED FOR SHIP SALVAGING

In view of the tremendous losses sustained by merchant shipping during the war, much interest attends the development of improved salvage equipment. Among apparatus that are claimed to embody advantageous features is a hoisting pontoon recently invented by a man long engaged in ship-raising operations.

Essentially the vessel is bargelike in design, broad of beam, and possessed of liberal depth of hull. It serves as a lighter, affords quarters for the wrecking crew, and is equipped with workshops. Tracks for traveling derricks extend along both its sides, while buoyancy chambers are provided beneath the lower deck. These are air-tight compartments which, when flooded, lower the vessel so that it can maintain the desired position in a heavy sea, and, when pumped dry, enable the buoyancy of the pontoon to be utilized for hoisting purposes. Along one side of the craft is a continuous double series of tubelike cableways, while arranged along the deck, adjacent to the ways, is a line of power winches. The cableways are of two types; one extending perpendicularly through the craft, and the other arranged angularly so that its lower opening is not far below the water line. The chains accommodated in the first-mentioned tubes pass beneath the hull of the ship to be raised, the others attaching to the upper part of the hull. Two advantages are claimed for this arrangement. One is that the double hold keeps the submerged ship on an even keel while it is being raised. On the other hand, it is conceivable that a ship might lie at such a depth as to prevent divers from passing cables beneath it, and still not be too far down to preclude attachments being made at the gunwales.

As is quite obvious, at least two of the

pontoons would be used together in salvage work, one being stationed on each side of the wreck. Booms hold the pontoons apart and away from the sunken ship while they are operating opposite each other. In the event of a large ship being in hand, two or three of the hoisting vessels would be placed end to end on each side. It is estimated that two 260-ft. pontoons working in unison would exert a lifting force of from 12,000 to 14,000 tons.

BENEFICIAL EXERCISER FOR PARALYTICS

An exerciser designed for a partly paralyzed person is said to have proved beneficial in bringing affected members into action and stimulating the circulation. It consists of a stool, from one side of which projects a metal support for a vertical lever. The latter has handles at its upper end and foot rests at its lower end, while a shaft connected with it is eccentrically attached to a flywheel under the seat. The patient pushes the handle backward and forward, placing the feet on the foot rests, and after the wheel is once started, it is an easy matter to keep the apparatus going.

An Exerciser for Partly Paralyzed Persons: The Horizontal Shaft Shown Connects the Lever with a Flywheel Concealed under the Seat. When Once the Wheel is Started, Little Effort is Needed to Keep the Apparatus Going

REPORT ON "HAIL RODS" NOT FAVORABLE

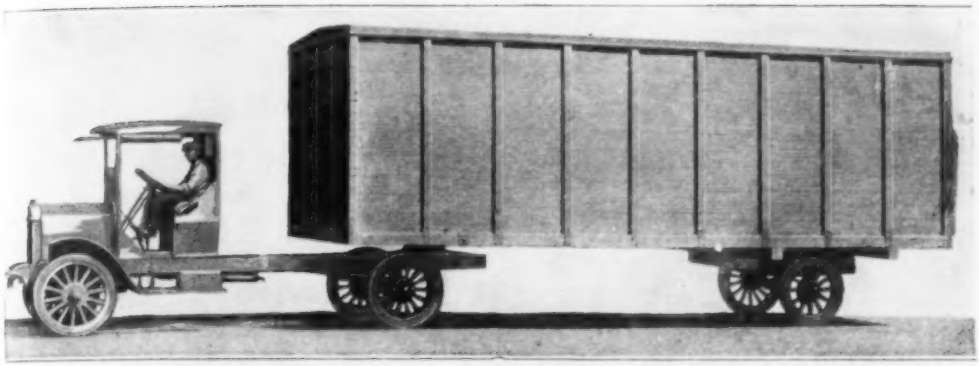
In recent years extensive use has been made of "hail rods" in the vineyards in the region of the Gironde, France, it being claimed that they furnish protection against hailstorms. Recently an investigation of their effectiveness covering several years has been made and it has been found that hailstorms have occurred in the neighborhood of many such installations. Some persons contend that there has been an absence of these storms since they set up the rods but the investigator points out that this may be mere coincidence. While reserving final judgment as to the rods, the report calls attention to the fact that in this region only one thunderstorm in five is accompanied by hail, and that often there will be an entire absence of hail for several seasons, following two or three seasons marked by hailstorms.

PLAN TO CLASSIFY ATHLETICS SCIENTIFICALLY, PROPOSED

All athletics should be reclassified according to their effects on the heart, and other vital organs, in the opinion of a naval officer who has given the subject much study. The emphasis given to certain sports in high school and grammar school, because they are the most popular, he declares to be most injurious. He advocates that each child in grammar school be assigned to the physical activity best suited to his needs, and this should be determined by his family history, his personal record as to illness, his physical type as determined by height and weight with relation to age.

HANDY DEVICE FOR MIXING PAINT

A handy paint mixer has recently been patented, consisting of a handle to which are secured two metal blades, intersecting each other at right angles. The lower portion of each is of dovetail shape, while above it is a pair of wings. The device is operated by immersing the blades in the paint, and then revolving them rapidly by placing the handle between the palms of the hands and moving them back and forth, as if rubbing them together.



A New Adjunct of the Air-Craft Industry: A Motor-Truck Outfit Designed Especially for Carrying Aeroplanes and Aeroplane Parts. The Body Is 25 Feet Long

MOTOR OUTFIT FOR CARRYING AEROPLANES AND PARTS

The recent appearance of a motor truck and trailer for carrying aeroplanes or aeroplane parts is one of the evidences of the growing importance of the air-craft industry. The body of this trailer is almost as big as a box car, measuring 25 by 10 by 7 ft. These dimensions permit the carrying of passenger planes of many different types, unassembled. Access to the interior can be had only at the rear, where a door with a suitable lock is provided. The frame of the body is of wood and the walls are ceiled on the inside.

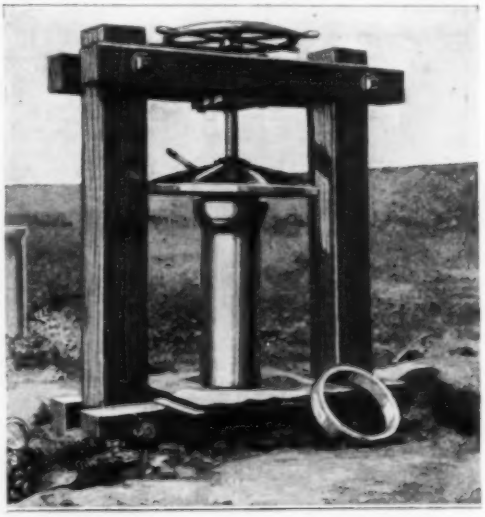
PERPETUAL LICENSE NUMBERS FOR COLORADO AUTOS

A license-number plate for automobiles, indicating the fee paid by the owner for the license, has been adopted in Colorado, which can be used year after year. At the right-hand end of the numbered metal plate are grooves for inserting a metallic disk, which is changed annually and bears the state seal and year date. Holding it in place is a metal letter—A, B, or C—the letter used indicating the license fee paid, and enabling any observer to tell if the payment corresponds to the size of the car.

¶An English scientist has made investigations which indicate, it is said, that the coal and shale dust inhaled by miners is rapidly eliminated from the air passages by special dust-collecting cells which break up the dust particles and carry them away without causing serious injury. Quartz dust, however, being made up of sharper particles, is not so easily eliminated and is more harmful.

APPARATUS FOR TESTING CONCRETE PIPE

A new machine for subjecting concrete pipe, and the like, to high water pressure, for test purposes, consists of an upright frame supporting a head with a smooth under surface, which is raised and lowered by means of a handwheel. The pipe to be tested is placed, bell-end up, beneath the head, and in the bell is placed a cast-iron ring with rubber packing on its upper and lower faces. The head is then



Apparatus for Subjecting Concrete Pipe to Hydraulic Tests: Water under High Pressure is Forced into the Pipe from Underneath

pressed down onto the ring, making a water-tight joint. The pipe is filled with water through a suitable inlet at the base and the pressure made as great as desired. A gauge enables the operator to watch the progress of the test. An air and a water outlet are also provided.

No Toys are Enjoyed Like Those Children Make Themselves. This has been Shown in One of the Cincinnati Schools Where the Above Picture was Taken. With the German Makers' Products in Disfavor, Toy Making has been Introduced in the Manual-Training Department of the Cincinnati Schools, and the Boys and Girls Shown Here Are Some of the First Who have Had the Fun of Actually Making Playthings. Old Cigar Boxes and a Little Paint Are the Materials Used

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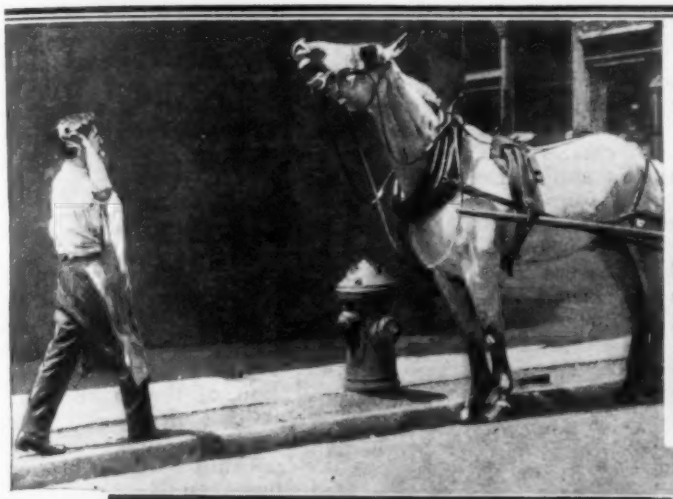
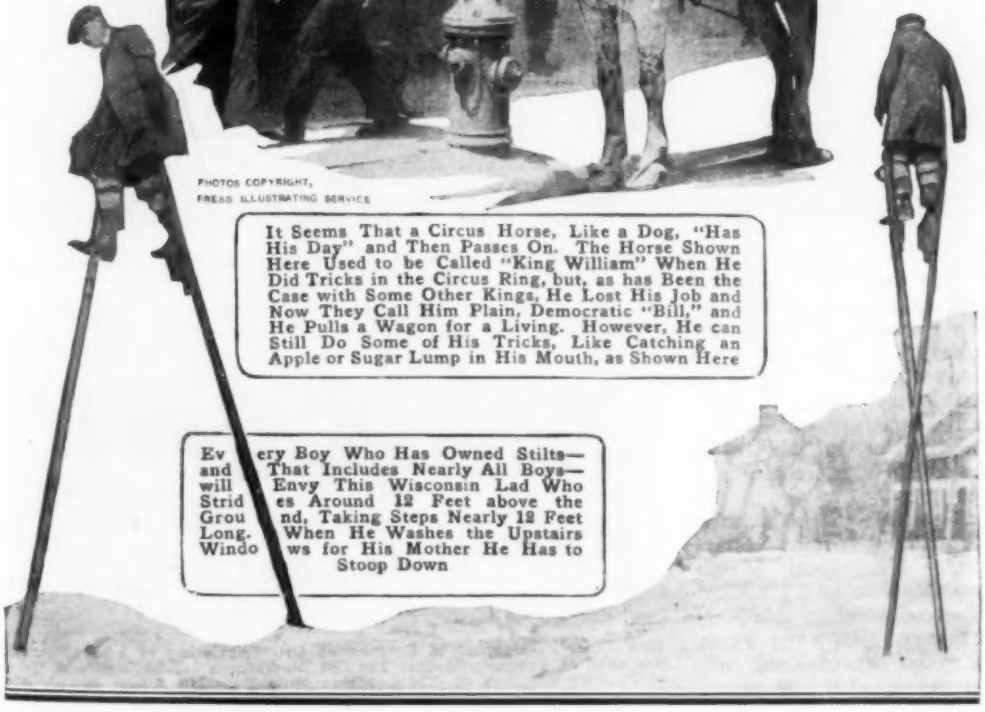
Here Are Some Little Children in France, Where Many Kinds of Material—Especially Coal—Are Still Hard to Get. They are Following a Big Coal Cart, Hoping to Pick Up Some of the Lumps, if Any Fall Off, and Take Them Home in Their Baskets. That Shows How Scarce Coal Is in France, Nowadays



Sometimes Cats Learn Surprisingly Bad Habits. Here Are Two New England Pussies, for Example, That Root Around in the Mud at Low Tide Like Certain Fat Animals That Are Not Nearly So Clean as Cats Are. These Two are Catching Fish and Clams

PHOTOS COPYRIGHT, PRESS ILLUSTRATING SERVICE

It Seems That a Circus Horse, Like a Dog, "Has His Day" and Then Passes On. The Horse Shown Here Used to be Called "King William" When He Did Tricks in the Circus Ring, but, as has Been the Case with Some Other Kings, He Lost His Job and Now They Call Him Plain, Democratic "Bill," and He Pulls a Wagon for a Living. However, He can Still Do Some of His Tricks, Like Catching an Apple or Sugar Lump in His Mouth, as Shown Here



Every Boy Who Has Owned Stilts—and That Includes Nearly All Boys—will Envy This Wisconsin Lad Who Strides Around 12 Feet above the Ground, Taking Steps Nearly 12 Feet Long. When He Washes the Upstairs Windows for His Mother He Has to Stoop Down

NEW ONE-WHEEL FARM TRACTOR MAKES RIGHT-ANGLE TURNS

Novelty of design is found in a new farm tractor that is able to turn in a four-foot radius. The machine is mounted on one large drive wheel, which carries almost all of the weight, and is supplied with a pair of small casters. A four-cylinder, 30-hp. motor is employed. The driving is accomplished by chains from a jackshaft. The outstanding feature of the tractor is that it can be turned at right angles. This enables, for instance, a square cut to be made when a binder or mower is used. Another interesting point is that the machine pushes a binder, thereby enabling a disk to be attached at the rear to furrow the soil as the grain is reaped. Likewise a grain drill can be pushed by the machine and a drag pulled at the same time, so that two operations are accomplished simultaneously. Ordinary horse-drawn implements are suitable for use with the tractor. The machine weighs about 5,000 lb. and has a channel-iron frame that is 8 ft. 2 in. long and 6 ft. 10 in. wide.

Among the Several Novel and Advantageous Features Possessed by the New Tractor Is Its Ability to Turn at Right Angles. Most of the Weight of the Machine is Balanced on Its One Big Drive Wheel

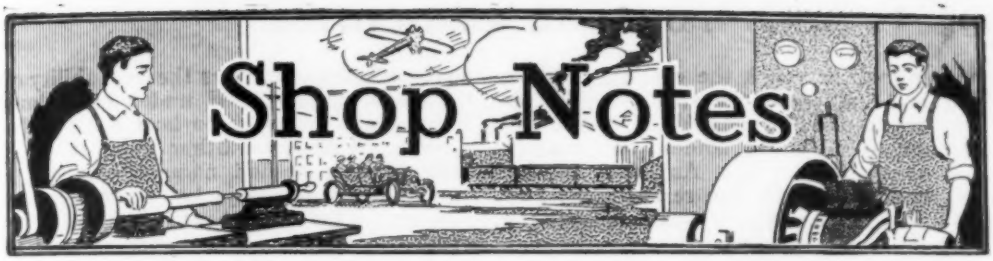
NEW DRY-CELL BATTERY IS RECHARGEABLE

Exceptional claims are made for an entirely new type of dry-cell battery recently put on the market, it being the contention of the makers that it will not only retain its maximum efficiency without deterioration, but can be recharged from 10 to 12 times. Instead of manganese ore being the principal ingredient as in other batteries, a special combination of chemicals has been substituted. In recharging, it is not necessary to add any chemicals or change any electrodes. With a rated capacity of 12 to 15 ampere-hours, it is claimed that these batteries will carry a four-ampere load two and three-tenths hours, and other loads correspondingly in excess of what is the common performance. For recharging, special rules must be followed.

THOUSAND BARRELS OF OIL FOR PACKING SARDINES

In one week during the past season there arrived at Eastport, Me., 1,000 bbl. of cottonseed oil for use in packing sardines. At prevailing rates, the oil was worth $85,000. When it is remembered that this consignment is but a fraction of the total used in Maine in the course of a year, the magnitude of the sardine industry becomes apparent. The total Maine pack has reached approximately 2,800,000 cases of 100 cans each. Besides cottonseed oil, quantities of mustard, peanut oil, vinegar, and tomato sauce are used by the packing concerns.

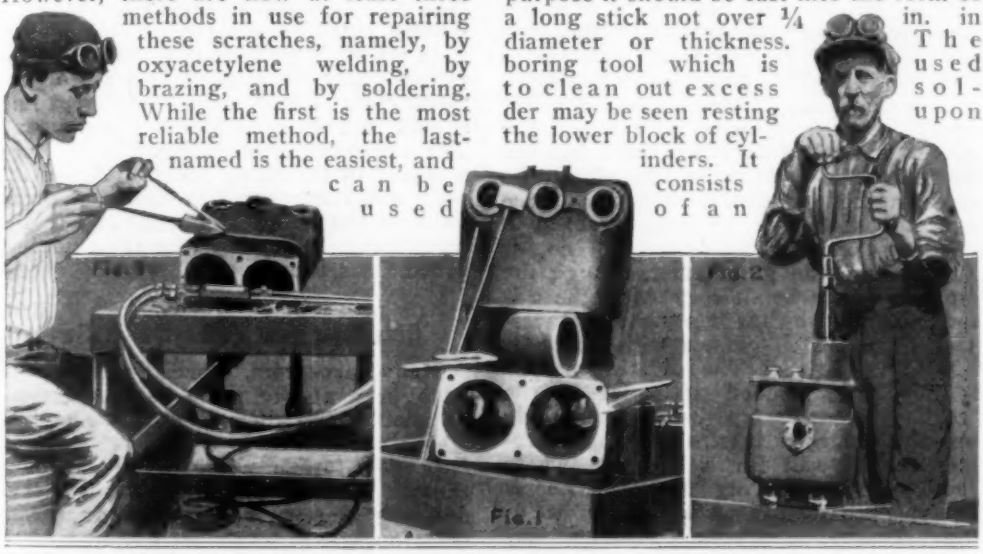
One Week's Shipment of Cottonseed Oil, Consisting of 1,000 Barrels, Received at Eastport, Maine: The Oil Was Worth $85,000 and was Used in Packing Sardines of Which Maine Now Puts Up About 280,000,000 Cans per Year



Scored Cylinders Repaired by Soldering

By DAVID BAXTER

REPAIRING scored cylinders in automobile engines is a somewhat difficult job, and one which requires some skill, by whatever method it is attempted. Until recently, it was considered that cylinders which were badly scored required reboring and fitting with oversize pistons. However, there are now at least three methods in use for repairing these scratches, namely, by oxyacetylene welding, by brazing, and by soldering. While the first is the most reliable method, the last-named is the easiest, and can be used where the apparatus necessary for either of the other methods is not available.



Solder can be Used for Filling Up Scored Places in Automobile Cylinders and for Repairing Cracked Water Jackets. The Apparatus Required is Not Expensive

The soldering method may, however, make use of some of the same apparatus as is used in welding, if this is available. The welding torch may be used for heating the soldering copper, and the cylinder should be heated preparatory to soldering, in the same way as for welding, except that the temperature required is not so high.

The tools needed are shown in Fig. 1. Leaning against the top cylinder casting is the soldering copper, which consists of a small piece of copper, fastened on the end of a long iron rod, about 3/16 in. in diameter and 18 in. long. The copper itself is ½ by 1¾ by 2 in. in size. It is bent or curved to fit the inside of the cylinder. The surface is polished and tinned. Beside the soldering copper stands the stick of solder. This is ordinary half-and-half tin-lead solder, with a little more tin added. For this purpose it should be cast into the form of a long stick not over ¼ in. in diameter or thickness. The boring tool which is used to clean out excess solder may be seen resting upon the lower block of cylinders. It consists of an old piston sawed off at the solid end, with a shank attached to a pin in the piston-pin holes. The other end of the piston is notched clear around, so that it cuts out the excess solder. The glass to the right contains the solution with which the surface of the steel is cleaned before tinning. A good solution consists of equal parts of blue vitriol and sal ammoniac, dissolved in water.

The process is as follows: First clean thoroughly the scored place, and a strip 1 in. or so wide on each side of it, with emery cloth or steel wool. Then place the scored cylinder over a gas burner or suitable heater, until it is warm enough to fry the soldering solution. Don't get it

hot enough to crack the casting. While this is being done, the special soldering copper should be heated. Get it hot enough to melt the solder, but not so hot as to spatter it. As soon as the copper and cylinder are ready, apply the solution to the scored surface, making sure that every portion of it is moistened with the liquid. When dry, fill the score with melted solder by inserting the stick of solder into the cylinder and putting the hot copper against it. After the score is entirely filled with solder, allow the whole thing to cool; then reheat the copper and smooth out the solder. Work the copper back and forth or sideways like a trowel, until every crevice is full of solder. Allow the cylinder casting to cool again, and then employ the hand borer, as shown in Fig. 2. The boring tool should fit the cylinder quite snugly; if it is too loose, it may be possible to peen the inside of the piston surface with a ball-peen hammer even all around, so as to expand it.

The reliability of this method depends upon the thoroughness with which the solder is applied to the scored portion. Sometimes it is necessary to reheat the soldering copper several times during the process. Either a welding torch or a common tinner's blowtorch, will do, or even a common gas burner, though the work will then be slower. After the cylinder is bored out, it is sometimes necessary to polish the solder with waste or with a scraping tool. The soldering method is not recommended as equal to the welding process, but it is particularly valuable on rush jobs where the customer cannot wait for welding, or where there is no welding shop which is equipped to do the work. When welding cylinders, it is sometimes necessary to put in new pistons, as the cylinder has to be bored oversize; with the soldered cylinder, the old pistons can be used.

The question which will occur to the mechanic is whether a soft solder can be relied upon to remain solid under the temperatures prevailing in an engine cylinder. This is unquestionably the weak point of the method, but it should be remembered that the lower part of the cylinder, where the worst scores often occur, does not get so hot as the combustion chamber above, and that in any case the inner surface of the cylinder does not reach anything like the temperature found at the center of the piston head, unless the cooling system is allowed to run dry. But in deciding whether to apply the soldering method, the location of the scores should be considered, as well as the probability of the engine being used under conditions which would cause it to heat up greatly.

Figure 3 shows another application of the soldering method, namely, repairing a crack in the water jacket of a cylinder casting. This is not recommended for great reliability, but it is often useful in a pinch. The process is very similar to that described above, except that the common soldering copper is used. The line of the crack is cut out to a V-shaped groove, as for welding. This groove is made with a cold chisel, almost to the full depth of the metal's thickness, and about ¼ in. wide at the top. The groove is painted with the acid solution; it is then filled with melted solder and smoothed down with the soldering copper. Again, the chief requirement is to see that the soldering powder is thoroughly stuck to the iron. The appearance of such jobs is very neat, but although they have been known to give satisfaction for months, the repairing should not be regarded as permanent. The upright casting in Fig. 1 shows such a repair to the water jacket. Along the right and lower edges of this casting can be seen the white marks which are the only visible indication that the soldering process has been applied.

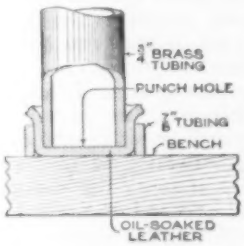
Sharpening a Worn-Down Saw

Many carpenters, especially those who have been at the trade for some time, number among their tools a saw or two which, through many filings, are worn to half their former width. The handle is thus in the way of the saw-filing clamp and must be removed for filing, or at least three or four screws must be removed to permit the handle to be turned back. This consumes time, and, since each screw consists of two parts, often results in the loss of a needed and not easily replaced screw. An easy way out of the difficulty, and one which does not harm the saw in any way, consists in enlarging the holes of all except the uppermost screw to notches leading to the edge of the saw blade, these notches being shaped in conformity with the circle traced by each

screw when the handle is pivoted on the one at the top. This is easily done by removing all but the pivot screw and swinging the handle about on it, while a pencil is held against first one, and then the opposite side of each screw hole, thus marking the path of each over the blade. The slots can then be cut out, following these marks. To get a saw thus prepared ready for filing, it is only necessary to give each screw a half turn and swing back the handle.—Henry Simmons, Los Angeles, Calif.

Making Gasoline-Torch Piston Leathers

Piston leathers for gasoline torches can be made as indicated in the illustration, by using a short length of ⅞-in. thin brass tubing as a form, and then driving a piece of oil-soaked leather into it with a section of ¾-in. brass tubing, used as a punch. Place the piece of ⅞-in. tubing, which should be about ¼ in. high, on the top of the bench. Lay a piece of leather, the same thickness as the old one, over the top of the ⅞-in. tube. By forcing the ¾-in. tube down, as shown in the picture, the leather will be molded into the form required. It can then be trimmed off evenly around the top of the ⅞-in. tubing ring. The leather should be permitted to remain in the form for a few hours, or overnight if possible, after which it will retain the required shape. A hole should be punched in the middle of the piston leather to accommodate the screw which holds it to the piston head. If, after using, the piston leaks, soapsuds should be poured around it rather than gasoline. If gasoline is used, it will dissolve the oil on the piston leather and spoil it.—L. M. Dyke, St. Louis, Mo.



Old Linen Collars Make Good Marking Tags

From discarded linen collars, excellent tie-on labels, or tags, can be made. The glazed surface which comes about with the repeated starching makes an excellent surface to write upon. A hole is punched at one end, through which a short length of string is twisted. Labels made in this way are very durable, and will not pull away or tear.

Saving Gas in Heating Water

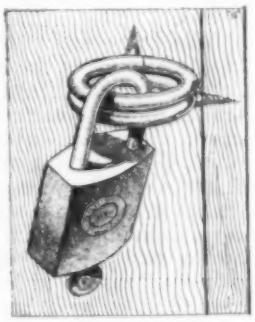
A vessel which will heat water on a gas stove more quickly than will an ordinary pan or kettle, and which will for this reason save gas, can be made by soldering an inverted funnel into the bottom of a tin pan. Nearly the whole portion of the bottom of the pan that is covered by the funnel should be cut away, so that the hot gases from the flame can go up through the funnel as well as around the sides of the pan. It is this double heating that makes the vessel efficient.—Harvey Mead, Scranton, Pa.

Salt in Whitewash

Where it is customary in the summer months to whitewash hothouse or greenhouse windows to keep off some of the hot rays, it is necessary to clean the windows in the winter time, and it is usually hard to remove the old covering. By putting one gallon of common salt in a barrel of whitewash, a mixture will be made which can be removed easily.

Screw Eyes Carry Padlock

In applying a padlock to a door, the main requirement for the hasp is that it should be fastened in such a way that no screws are exposed when the lock is on; otherwise the lock can be removed by taking out the screws with a screwdriver. An equally effective method of applying a padlock, which does not require the use of a regular hasp, is to insert two screw eyes in the position shown; one in the door, and the other in the door jamb, so that they come close to each other when the door is closed. When the padlock is attached as shown, the screw eyes cannot be unscrewed.—J. H. Norrell, Augusta, Ga.



Testing Seed Corn for Germination

By H. A. FRANKLIN

THE average yield of corn throughout the United States is not far from 28 bu. per acre. There are 4,800 hills of corn to the acre, planted 3 ft. apart each

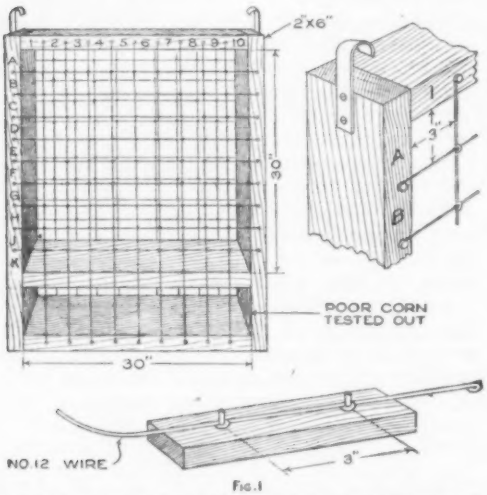


Fig. 1

Seed-Corn Ears are Kept in Racks, Each Numbered and Tagged, While the Kernels from It are being Tested for Germination

way. Three stalks to the hill and one ear on each stalk would yield 14,400 ears, which, at half a pound to the ear, would make 7,200 lb. or 130 bu. of shelled corn per acre. This is not all theory, for corn-club boys have produced such yields in a dozen different states. The difference between this and the average yield corresponds to the difference between the old-fashioned way of planting by the rule of thumb, and the new way of applying scientific knowledge to the growing of crops.

The first step in the production of large yields of corn is the selection of seed with strong vitality from the best-producing stalks in one year's field for next year's crop. The best-looking kernels may be dead. Some grains of corn that germinate fairly well show weak roots or sprouts. Stalks grown from such seeds fail to have ears. Leaving out the question of poor soil and a badly prepared seed bed, the two principal causes of low yields of corn are vacant hills and barren stalks, both of which may be prevented by thorough ripening, careful curing, and the final process of elimination by testing the germinating qualities of each seed ear in the incubator. Growing three productive stalks to the hill without any skips, or the same ratio when planted in drills, is too near perfection to expect, but intelligent effort, with the assistance of modern machinery and laboratory appliances, will always increase the yield.

The seed-curing rack, here shown, will hold 100 ears of seed corn, each ear in a separate compartment, from the day the ears are selected in the field, through the final ripening and curing processes and the testing of each individual ear for germination, to the final selection for planting; and each of the 100 ears will retain its identity throughout the test.

Each ear should have a card fastened to the butt end of the cob, preferably by a thin, blind staple. On the card is marked the number corresponding with the wire pigeonhole that the ear occupies. These numbers will read A1, A2, etc., using the first 10 letters of the alphabet with the exception of letter "I," as shown in Fig. 1. The same system of letters and figures will identify the five grains from any ear while they are being tested for germination.

The incubator cabinet, Fig. 2, completes the equipment for the scientific handling of seed corn, which includes also a permanent record such as modern farming demands for the registration of pure-bred seed. This record is made by marking the date and result of each germination test on the card that is attached

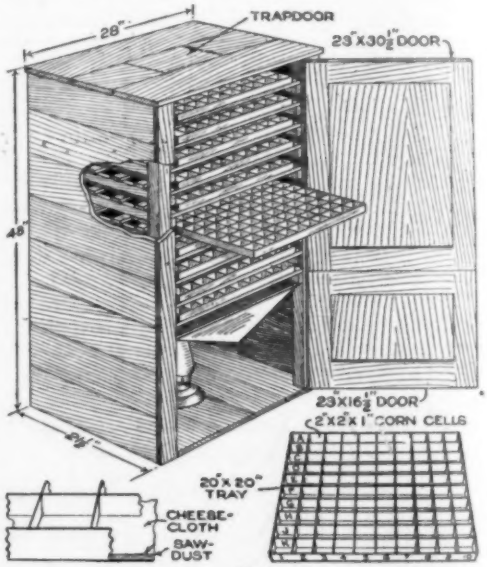


Fig. 2

The Testing is Done in an Incubating Cabinet, Where Five Kernels from Each Ear are Kept Warm and Moist by Steam Generated Below

to the cob. The cabinet is used in connection with the curing racks, to test the

fitness of the different ears for seed. Its capacity is 1,000 ears, or equal to 10 seed-corn racks as represented in Fig. 1. The racks and drawers may be numbered correspondingly from 1 to 10, so that, for instance, 9-J-8 will indicate the eighth compartment in row J of the ninth drawer, containing grains from ear No. 9-J-8, which is placed in the ninth rack, row J, eighth space.

This testing cabinet is 48 in. high, 28 in. wide, and 21½ in. deep. The four corner posts are 2 by 2-in. strips. The cabinet is boxed in with sound ½-in. ceiling lumber of the matched variety. The top is also of ceiling lumber, with a trapdoor in the center. The bottom pair of cleats, on the corner posts, are nailed on 15 in. from the floor. The other cleats are 3 in. apart, as shown in the drawing. These cleats support the shelves, and should be of sound material, 1½ in. wide by ⅞ in. thick. The shelves are made of slats so that the temperature will be more uniform, but they must be level, straight, and true.

The tin deflector is filled with water to supply moisture. It also prevents excessive heating of the lowest pan; it distributes the heat in equal amounts on either side of the lamp, and starts it up at the sides of the cabinet to circulate around each pan alike. The heating arrangement is more or less automatic in that each pan receives an average amount of heat, and the temperatures at various heights are as nearly uniform as is easily obtainable. The temperature should be maintained between 72 and 80° F. The trapdoor ventilator in the top lets out the superheated air when necessary. A good lamp of the incubator style furnishes heat, and is not easily put out of service.

The pans should be of No. 24 gauge galvanized iron. They should be made accurately to size, 20 by 20 in., fitted with nine tin partition strips running each way, thus dividing the pan into 100 divisions, or compartments, each 2 in. square and 1 in. deep. The tin partitions are 1 in. high, and the tin strips are 20 in. long. They are cut to the center at intervals of 2 in., and pushed together like the paper strips in an egg carton, and may be touched with solder at the joints to make the racks hold together. They can then be lifted out of the pans and cleaned with boiling water or live steam, after each test, to kill spores.

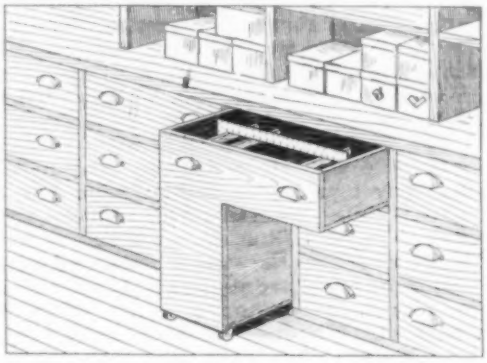
The sides of the various cells are marked on the left with letters and on the front with figures, with a waterproof crayon, the letters and figures corresponding with those on the corn-curing rack. This system positively identifies the five grains in the tester with the ear in the rack.

The front is closed with two doors of the same material as the sides and back; the upper one incloses the pans, while the lower one covers the lamp.

To operate, put warm water in each pan, about ¼ in. deep, and put in five kernels from every ear to be tested in their proper cell. Seeds must have air as well as moisture, so it is better to sift a layer of fine sawdust over the pans, then cover the sawdust with a square of cheesecloth, place the racks in position, and put the kernels of corn on top of the cheesecloth. This cabinet, without the tin racks, may also be used as a sprouter for grain in the winter months, when grain feed is so greatly desired in the poultry yard.

Hardware Store Has Special Drawer for Carpenters' Squares

One of the problems of the retail hardware store is to arrange the stock of carpenters' squares so they may be easily displayed, and yet take up as little room as possible. They are awkward articles to arrange, and no little trouble to the clerks. One store overcame the difficulty in the following manner: A drawer was built to conform to the shape of the squares, and was so constructed that it could be easily rolled out of its pocket in the wall case, displaying the entire line of squares at once. The drawing shows how the drawer was built and how the otherwise dead space below the horizontal section of the drawer was used to house a number of small drawers, thus utilizing the entire space.—L. B. Robbins, Harwich, Mass.



A Drawer Especially Built to Accommodate Carpenters' Squares Is a Neat Device in Any Hardware Store

How a Big Tree Is Moved

It has been known for a long time that even large trees can be moved from one place to another without injury. This

By Digging Out the Ground Properly and Providing Runways of Lumber It Is Possible to Remove Large Trees Successfully

must be carried out during the natural resting time of the tree, that is, in the winter. The remover of big trees strives at all cost to avoid injuring the roots more than is absolutely necessary, and to this end a square of soil is cut out all around the tree. On one side, an opening, or slipway, is made, as can be seen in the photograph.

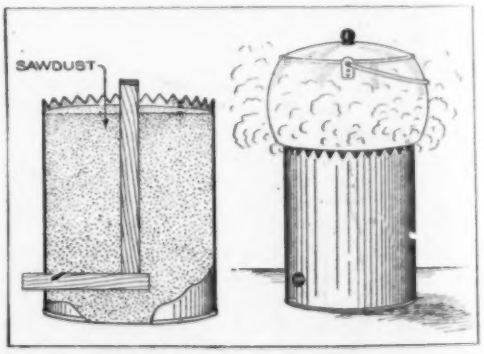
The most difficult part of all is to cut under the tree so as to sever the roots that may have penetrated to some depth in the soil. Several small tunnels are opened up, and from these the separation of the tree from the subsoil is carried out. Planks of wood are slipped under the tree to act as runners on a track which is prepared. The tree is then hauled by horses or, in the case of a very large specimen, by mechanical power. The ropes are placed round the square of earth, as it is dangerous to pull on any part of the tree itself. Before the removal of the tree is attempted, the new position must be ready. Down toward the excavation, a track is cut out so that the tree will travel easily into the new location.—S. Leonard Bastin, Bournemouth, England.

Starting Auto in Deep Sand

A farmer, located in a very sandy country, was sometimes embarrassed because friends who came to see him found that, upon leaving, they encountered a great deal of trouble in getting their cars loosened from the deep sand. After the experience of furnishing to one of his guests a pair of mules and a quantity of heavy planks, he devised a much less troublesome method for the next case. He got from his barn an old horse blanket and spread it on the ground in front of the drivewheels. The difficulty, of course, is the tendency of a heavy machine to bury itself in the sand, by constant efforts to start. As soon as the wheels climb onto the horse blanket, even if they drag it part way down into the sand with them, the burying tendency is checked.—Samuel C. Appleby, Baltimore, Md.

A Stove That Burns Sawdust

A simple stove made of sheet iron, using only sawdust for fuel, will burn a long while on one charge, giving sufficient heat to cook a meal. The stove itself is an iron can, from 6 to 8 in. in diameter, and about the same height. The bottom must be riveted to the sides. A 1-in. hole is cut on one side, 1 in. from the bottom. Around the top of the can, a number of notches are cut, ½ in. deep and ½ in. wide. To start the fire, sprinkle sawdust in the bottom of the can up to the 1-in. opening. In this hole place a round piece of wood long enough to reach a little past the center of the can, and to leave a grasping length outside. Rest a similar piece vertically upon the first one, in the center of the can. Then pack sawdust tightly to the level of the notches in the top. After carefully removing both sticks so as not to jar sawdust into the holes left, stuff a bit of crumpled paper into the 1-in. opening,



A Simple Sheet-Iron Stove, Which Burns Sawdust, Furnishes Heat Enough to Cook a Meal

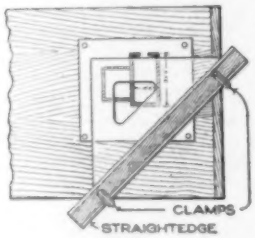
and light. In a few minutes the whole mass of sawdust will glow with a red heat which will last for a long time.

Removing Wall Paper with Steam

Stripping wall paper from the walls of a room is a tedious and unpleasant task. The following method has been found to do this work satisfactorily: Remove all furniture from the room and take up the floor covering; place, in the middle of the room, some kind of a portable stove with a big pan of water on top. Light the stove and close all the windows and doors; when the room becomes full of steam, it will soften the paste which has been used for sticking the paper on the wall. After an hour or more of the steaming, it will be easy to remove the paper.

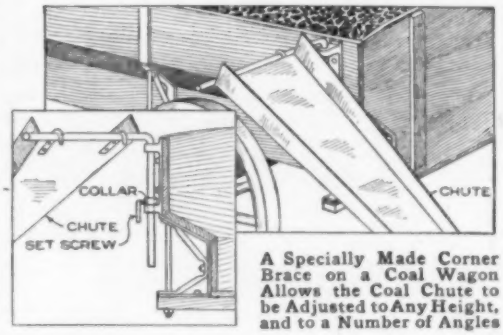
Small Drafting Work Easily Done without a T-Square

Small mechanical drawings, which consist mostly of horizontal and vertical lines, are made most quickly by using, instead of a T-square, a straightedge and the 45° triangle. Clamp the straightedge to the table, diagonally, so that it is below and to the right of the space where the drawing is to be made. Lay the triangle with the long side against the straightedge; the triangle should be large enough so that, as it slides along the straightedge, it will pass over the whole space to be covered by the drawing; that is, the drawing will lie between the straightedge and the line of motion of the vertex of the triangle. If these conditions are fulfilled, all vertical and horizontal lines can be made with the two sides of the triangle; for lines at 45°, 60°, or other angles, other triangles or a protractor will be required, as usual.



Adjustable Chute for Coal Wagon

The ordinary chute used by coal dealers does not always make it possible to fill the customer's bin without carrying. It is often supported by boxes and barrels, but this is not satisfactory. The chute can be made to fit a greater number of cases, and to give better service where used, by making an adjustable support for it on the back of the wagon. This support is really a part of the wagon box, but it allows the chute to be used in a number of positions, and gives it a firmer hold than is obtained by the usual method of hanging it over the edge of the box.

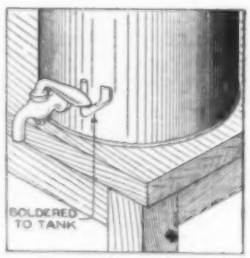


A Specially Made Corner Brace on a Coal Wagon Allows the Coal Chute to be Adjusted to Any Height, and to a Number of Angles

Changing the corner brace of the wagon box to meet the requirements may not be possible; a new brace is more practical. It should be made of heavy iron, the dimensions depending on the wagon and the chute. Two lugs, or ears, on the brace support a heavy iron rod which turns, hinge-fashion, on the lugs. A collar on the rod is provided with a set-screw so that the height of the chute with reference to the wagon box may be regulated. Heavy hooks on the chute fit over the rod, making a steady, firm support. If both back-corner braces are changed in this manner such a variety of positions is possible that the chute nearly always can be used successfully.—M. E. Duggan, Kenosha, Wis.

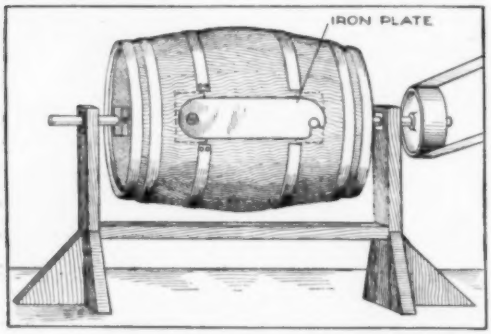
Stop on Faucet Avoids Oil Leakage

Quite frequently the faucet on an oil-supply can, such as is used around a machine shop for storing lard and machine oil, is not provided with a stop, with the result that in closing the cock it is pushed too far, and leakage and waste of oil result. A simple and easily applied stop, which is a successful cure for this difficulty, consists of a strip of metal, bent to the shape shown, and soldered in place so that the end of the handle strikes it, and is thus prevented from moving beyond the closed position.



A Barrel Tumbler for Punch Shop or Foundry

The usual method of removing burs from punched parts or sharp edges, and molding sand from fresh castings, is to



A Tumbler Made from an Ordinary Barrel will Do Good Work in the Small Shop

tumble them about in a rotating container. Broken pieces of carborundum wheels, emery sand, or some other abrasive, are usually placed in the container to hasten the burring process. The small foundry or punch shop cannot well afford to be without such a tumbler, particularly when one may be easily constructed from a stout barrel. If the parts to be tumbled are light in weight, a drive shaft, 1 in. in diameter, may be used. This rod should be long enough to pass through the barrel and allow about 1 ft. to project from each head, as shown in the sketch. A heavy block of hard wood strengthens the heads where the shaft passes through. A steel pin is driven through the wooden block, and into a hole drilled in the rod, so that the barrel will turn with the shaft. Suitable standards with bearings are provided to support the tumbler, and a pulley is placed on the shaft so the device may be driven from some outside source. Bearings may be made by wrapping the shaft with paper, and casting babbitt around it.

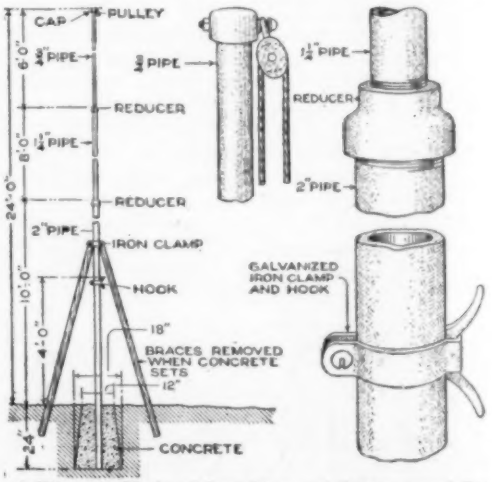
A hole should be cut in the side of the barrel, approximately 2 ft. long and 1 ft. wide. It will be necessary to sever the steel hoops at the point where the hole is cut, but before doing so, nail or screw the hoops to the barrel, near the cut-off point. Thus these hoops will remain to help strengthen the barrel. The cover placed over the hole is made of sheet steel, and arranged so it can be quickly placed in position or removed at will. A good method is to let one end swing on a heavy bolt, while the other end is shaped so it will hook over another bolt, which, when tightened, will hold the cover rigid.—Kenneth Coggeshall, Webster Groves, Mo.

Asbestos Hood for a Soldering Iron

An ordinary soldering iron may be carried some distance from the source of heat, and be kept at working temperature for 15 or 20 minutes, if the point is covered with a thick asbestos hood, made from several layers of sheet asbestos.—K. M. Anderson, Temple, Texas.

A Substantial Flagpole

A neat, substantial flagstaff is made of 12 ft. of 2-in. galvanized-iron pipe, a 2-in. to 1¼-in. reducer, 8 ft. of 1¼-in. pipe, a 1¼-in. to ¾-in. reducer, 6 ft. of ¾-in. pipe, and a ¾-in. cap, put together in the order named. Through the center of the cap a ¼-in. hole is drilled for the bolt which holds the small galvanized pulley to the top of the pole. A galvanized hook for the rope is clamped to the pole, 6 ft. from the lower end, with a strap of galvanized iron. A ⅜-in. rope of the best quality should be threaded through the pulley. The staff is set upon a rock in the bottom of a hole, 2½ ft. deep and 2 ft. in diameter, and is braced temporarily. Around it is poured a rather wet mixture of 1 part cement, 2 parts clean river sand, and 3 parts crushed rock. This should



A Flagpole Made of Iron Pipe and Fittings, and Set in Concrete, Is Durable in Construction and Graceful in Appearance

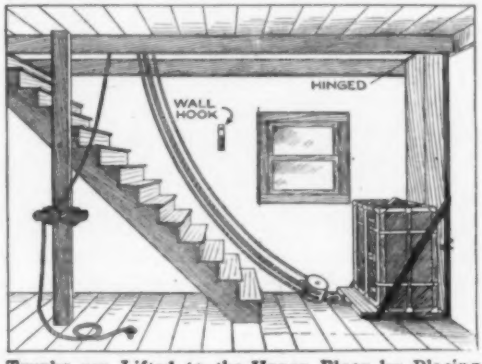
be rounded up above the surface of the ground. When the base has set firmly, the braces may be removed.

A Swinging Elevator for Trunks and Light Freight

A peculiar form of hand-power elevator, consisting of a hinged platform used in connection with a rope and tackle, will be found useful in homes where trunks are stored in the attic, and in many small shops where freight has to be moved by hand from one story to another.

The elevator is best built in connection with a stairway, although this is not a necessary feature. The platform proper is made of 2-in. material, or lengths of 1-in. lumber very strongly braced. At one end, it is attached with good strong hinges, as shown, while at the other end an end board is placed, large enough so that, when it is swung down into the lower position, a trunk or box may be raised onto it and will rest there securely. If this end board is braced on both sides, as shown, it will be necessary to detach the pulley block when loading on the freight. This is the preferable method, as it is very little trouble to detach the block, and the braces on both sides add much to the strength of the elevator. It may be desirable to leave off one of the braces, since the freight can then be loaded from the side without detaching the pulley block. The upper pulley may be fastened to the ceiling joists, or rafters, of the floor above. If sufficient power is not obtained by pulling the rope with the hands, it is, of course, possible to provide a windlass, or other means of increasing the pull, but this will not be necessary for trunks and like objects.

If the elevator is only to be used occasionally, it is entirely possible to leave



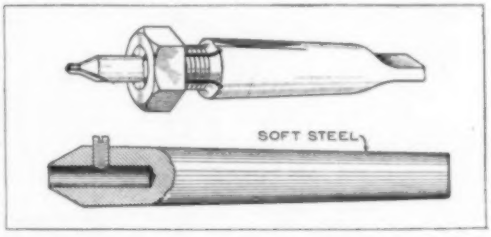
Trunks are Lifted to the Upper Floor by Placing Them on the Swinging Platform and Pulling on the Rope

it in the upper position so that its floor forms a part of the second-story floor. The rope end can also be carried up the stairway and fastened on a hook above, so that no part of the elevator is in evidence on the lower floor. For places where the elevator would be in more frequent use, it would be well to provide a hook, such as the one shown, on the wall, where the end-pulley block can be hung, out of the way but easily attached to the elevator in a few seconds.

This type of elevator is not adapted for freight which must be kept standing upright, but this will not be found to interfere seriously with its usefulness.—C. H. Patterson, Portland, Ore.

Countersinking Center Drills Held in Special Chucks

Combination countersink and center drills are in general use in machine shops, but many shops have inadequate means of holding them. The sketch shows two forms of chuck which are readily made for this purpose. The lower one is turned from a bar of machine steel, and has merely a hole in the end, with a setscrew for holding the drill. The taper of the chuck is made to fit the tailstock of the lathe. The upper sketch shows a chuck made from a worn-out ¾-in. twist drill. The end is turned down and threaded with a taper thread. A ¼-in. pipe thread was used on this chuck, and a nut was then tapped out with a standard ¼-in. pipe tap. Slots were sawed in the threaded portion, making spring jaws, a hole being drilled in the end, of the right size for the center drills used. The piece of twist drill should be retempered after it is cut

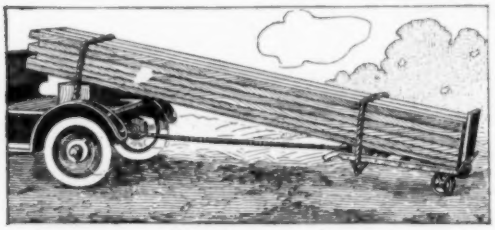


Two Handy Forms of Chuck, Readily Made, to Take the Combination Countersink and Center Drills Which have Proved So Popular

to this shape, and the nut should be case-hardened, or, if convenient, a nut may be made from carbon steel and tempered. —M. L. Lowrey, Livermore, Calif.

Load of Lumber Hauled by Light Car and Hand Truck

A load of 20-ft. lumber was to be removed, and no wagon or truck of the necessary length was available. The illustration shows how the job was done with a light automobile and a hand truck borrowed from a grocery. The rope from the rear axle of the car to the hand truck pulled the load, while the rope around the rear end of the lumber held the truck off the ground.—Edwin L. Camp, Huntington Park, Calif.

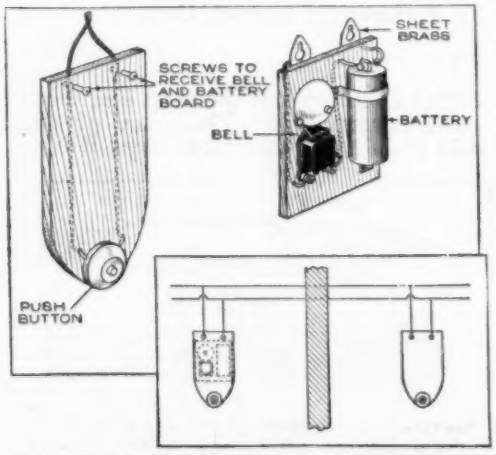


How a Light Automobile and a Hand Truck were Made to Do the Work of a Long Wagon in Hauling a Load of Lumber

Emergency Call-Bell System Has Permanent Wiring

When a person is taken sick in one room of a house, and must have means of calling for assistance from a person in another room, an electric-bell signaling system always is desirable. In time of sickness, however, there is likely to be small opportunity to rig up such a system, and its absence may cause real distress.

An effective way to be prepared for this condition, at no great expense, is to install in each bedroom, within easy access of the bed, a push button, mounted on a block, as shown in the sketch. These buttons are connected, in parallel, to a pair of wires which connect all the different rooms. At the top of the block are two screws, each of which is connected to one side of the wiring system. One or more bell boards, such as shown in the upper right-hand corner, are then made, so that they can be hung on the two screws in any room where the bell may be desired. The bell is mounted in series with one or two dry cells on this board, and the wires run underneath the board to the two sheet-brass lugs, which serve the double purpose of supporting the board on the screws and of conducting current into the wires. The weight of the bell board will be sufficient to give a firm contact, if the two lugs are set a good distance apart, and the weight on the board is fairly well balanced.



A Call-Bell System Which Meets Emergencies without Delay: Each Room Has a Push Button Permanently Installed, and the Bell can be Carried to Any Room Desired and at Once Placed in Service

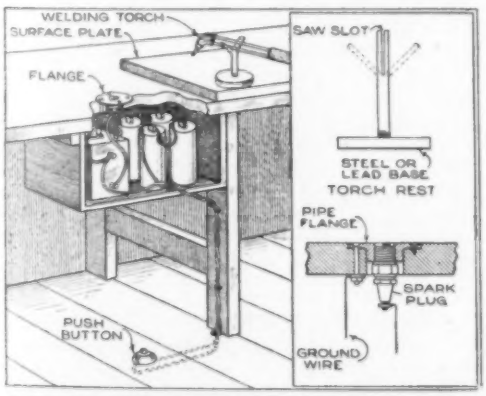
Should sickness occur in any room, it is then only necessary to see that the patient is within reach of the push button, and to hang the bell board in whatever room the nurse or attendant will be. Two or more boards can be used, the same push button then sounding the bells wherever they are placed. If the attendant's work calls her to another room, she can lift the bell board from the screws, take it with her to the other room, and hang it above the push button there. In rooms where use may at some time be found for one of the bells, but which are never used as bedrooms, it is not necessary to install buttons, but merely the two screws the proper distance apart, connected to the two wires which run from room to room.

In an ordinary call-bell system, the addition of extra bells to be sounded simultaneously means extra strain on the batteries, which they may not be able to stand. With this system of wiring, each bell has its own battery, so that any number of them can be hung up in different places and operated by any one of the push buttons without any extra load on the batteries. The bell board may be rigged as shown, or, if a louder alarm is wanted, two cells may be used, one on each side of the bell, in order to balance the weight properly. In times when there is no sickness, the call system may be put to various other uses, and in any case, at least one bell board should at all times be kept on hand, with a battery mounted on it, which is in serviceable condition.—H. E. Gifford, Medford, Mass.

Lighter for the Gas Torch Made from a Spark Plug

It is the practice in some shops to leave a welding torch burning with a small flame when it is not in use, owing to the time required for lighting it. Aside from the danger of fire caused by this custom, it always wastes more or less gas, which is not necessary if some apparatus such as that shown in the sketch is provided. Underneath the bench, in a box mounted for the purpose, are placed four or five dry cells, connected in the usual way to a jump-spark coil, such as used on automobiles or stationary gas engines. The high-tension terminals of the spark coil are connected to a spark plug, mounted as shown in the detail, so that the points are flush with the bench. In the primary circuit is connected a push button, which may be located on the floor, preferably sunk into it, so as to project no farther than the necessary distance for pushing the button with the foot. The torch is lighted by turning on the gas and bringing the nozzle near the spark plug, at the same time pressing the button with the foot. The time required for this operation is practically none, after the workman has become familiar with the location of the button and spark plug. In the upper right-hand corner of the sketch is shown a simple method of making a stand or rack for the torch, which will be handy in connection with the lighting apparatus.

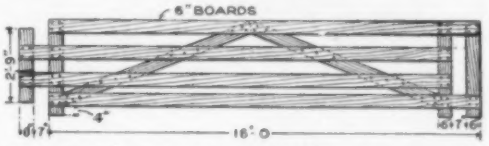
While the gas saved is perhaps a small item, the element of safety is more important, and since the amount of current used is very small, the apparatus will be advantageous in many shops where the all-around usefulness of a welding torch is appreciated.—C. C. Spreen, Detroit, Michigan.



A Spark Plug, Sunk in the Bench, and Connected to a Coil and Battery of Dry Cells, Eliminates the Necessity of Leaving the Torch Burning

Portable Fence Formed of Easily Detached Sections

Modern methods of raising live stock on the cafeteria plan require the use of a succession of pasture crops, planted in rotation to mature at just the time when they give the greatest food value, and in the amounts best calculated to furnish the necessary feed without waste. To use the plan with the greatest success it is necessary to confine the stock to the feeding ground ready at the time, so that they will not injure or waste the growing crops. Since it is not practical to cut a farm permanently into small fields, some system of portable fences must be used.



Universal Panel with Interlocking Ends Builds Portable Fence to Confine Stock to Small Feed Areas

Such a fence is set up very quickly by using a universal panel which may be put together in either of two ways, and which may be made of any size desired. The panels are built of boards, 6 in. wide and 1 in. thick. At one end of each panel a space is left into which an interlocking end of a similar panel will fit. The panels are made rigid with an inverted-V brace. The fence may be set up with the interlocking members forming a sort of zigzag, in which case the fence needs no other support; or, if so desired, the panels may be placed in a straight line, when it will be necessary to drive stakes on each side of the interlocking joints.—Herbert A. Shearer, Chicago, Ill.

Rubber Cement for Repairing Tire Valve

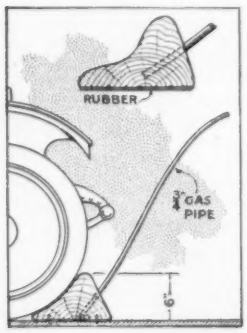
A bicycle rider found himself 15 miles from the nearest village, with a fast-leaking tire valve, due to the rubber washer being worn out. Remembering that he had some rubber cement in a tube, he applied a small quantity of it to the worn washer, and after letting it dry, inserted it again in the valve stem. It served the purpose perfectly until a new valve stem could be obtained.—Raymond Lister, Winnipeg, Manitoba, Can.

Headrest for Auto Mechanic Strapped to His Head

An automobile mechanic who had experimented with various devices to rest his head upon, while working underneath a car, found that they were all liable to the objection that, when moving around, it was difficult to move them and get them in the right place without losing considerable time. He then made a pad consisting of a block of wood lined with felt, to fit the back of his head, and provided it with a piece of tape which was tied around his forehead. He could thus move around under the car without worry as to whether his head would come down in a puddle of grease on the floor. Should the headrest come in contact with such a puddle, no other precaution is necessary than to slip it off the head before standing erect.—Glenn Bron, Salt Lake City, Utah.

The Auto Stop Block Reduced to Efficiency

To keep cars in place on the floor of the garage, the usual method is to set a block of wood against the tire, kicking it into place with the foot, which is a very easy and effective process. The trouble comes in removing the block, if it is tightly wedged in. To overcome this difficulty, a large eastern garage uses specially shaped blocks, fitted with pieces of gas pipe for handles. The blocks can thus be removed in less time, and quite easily.—P. P. Avery, Garfield, N. J.



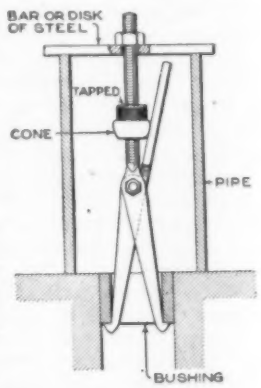
¶ Repair gums and tire fabrics received in cold weather sometimes appear lifeless when they are merely frozen. Thaw out the material in a warm room before using it.

Spring-Opening Lock Fitted on Ruling Pen

A small, stiff piece of spring steel, drilled to fit under the thumbscrew on an ordinary ruling pen, converts it into a spring-lock instrument. A curve on one end holds the blades together when the metal is turned the long way of the blade, while the other end is made long, to serve as a lever for unlocking. This is done by swinging the lever to one side, thus releasing the spring of the pen, and allowing the blades to open for inking; swinging it back brings the blades together again. Pens thus equipped give service equal to that of high-priced instruments. —Elmer O. Tetzlaff, Cicero, Ill.

An Adjustable Bushing Puller

Removing tight bushings is a subject which has engaged the ingenuity of many a mechanic. The device here illustrated may often enable one to extract, without damage, a bushing which would otherwise have to be cut in two in order to remove it. The materials necessary are a short piece of pipe, a steel bar, or disk, across the top, two pieces of steel rod, and two nuts. Both pieces of rod should be forged at the lower end to the shape shown; at the upper end one piece is threaded and the other is left smooth. They are riveted or bolted together, somewhat like a pair of heavy inside calipers. The piece of pipe should be cut out at one side to give access to the cone nut with the fingers. After it is tightened, the bushing is pulled up by turning the upper nut with a wrench.



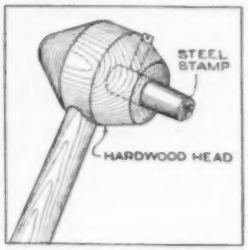
Draftsman's Triangle with Raised Points or Feet

A draftsman's triangle, of wood or composition material, may be fitted with three brass plugs, or rivets, located near the three corners of the triangle, riveted over to form similar heads on both sides. These will give two advantages in use. The tendency of the ruling pen to blur the line

when the ink comes in contact with the triangle will be eliminated, and the triangle will be much easier to lift from the table, as there will be sufficient space under it to insert the finger nail. Triangles fitted up in this way will save much time for the draftsman and tracer.—G. A. Luers, Washington, D. C.

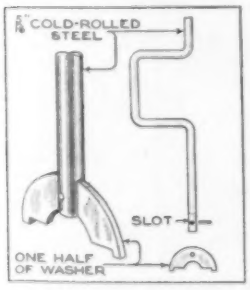
Inspector's Stamp Built into Hammer

Stamping of wood, or soft-metal, parts, such as might be required after inspection, is most quickly accomplished by constructing a stamping hammer, as shown in the sketch. A wooden head and handle are formed out of pieces of fairly hard, heavy wood, and a socket is cut in the head so that the metal stamp can be driven in securely. To stamp an article, simply strike a blow with the tool, instead of using the stamp with a hammer. Such a device is of use in stamping either inspection marks, figures, or letters required in processes of manufacture.



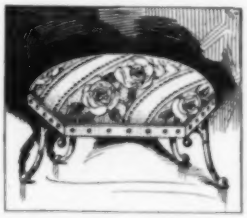
Valve Grinder Made from Washer

A valve-grinding tool such as this will be found very handy for valves which are provided with two holes for gripping them while grinding, rather than with a slot. The shank may be held in a bit brace, or it may be made longer and bent to the shape indicated, so as to be used like a bit brace itself. A heavy iron washer of the proper size is cut in half and filed so as to leave the two lugs projecting the proper distance apart to fit the holes in the valve. The shank is then pinned to the center of this semicircular piece, and the tool is ready for use. It will be seen that the tool has the advantage of equalizing the pressure on all sides of the valve, which greatly assists the formation of a good fit all around the valve seat.—J. E. Barkley, Detroit, Mich.



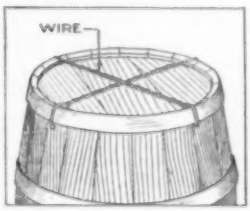
Footstool Made from Harness Hooks

A novel and pretty footstool may be made from a board, about 12 in. square; four harness hooks, 6 in. long or over, and a piece of brocaded velvet, or leather, for covering. Saw off the corners of the board, being sure to get the sides of equal length, thus making an octagon. Screw the four harness hooks under the stool where the corners were cut off. Pad the top of the stool, and cover it with the brocaded velvet or leather. Turn the edges of the covering material under at the lower edge, and fasten with tacks, completing the stool.—Mrs. Grace E. Willey, Concord, N. H.



Wires across Barrel Heads Give Protection

A concern which every year ships many tons of iron castings in barrels had trouble from the heads of the barrels being knocked out. It was found to help a great deal in preventing this to fix across the end of the edge of the barrel heads stout steel wires, twisted together, as shown in the sketch. Four holes were drilled under the first hoop; the wire was passed from one hole to the opposite one, doubled back, firmly twisted, and spliced. The crossing wire was put in in the same way. The barrels held together during long trips and much rough handling.—Irl R. Hicks, Centralia, Mo.

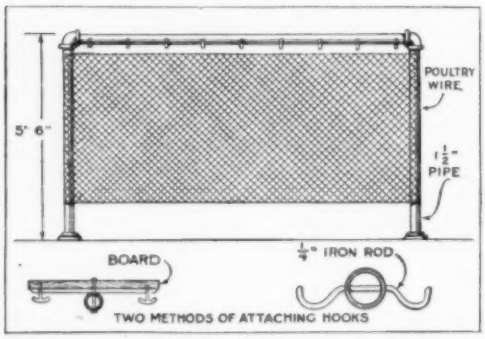


Reaming Large Holes with an Ordinary Twist Drill

Large holes that must be still further enlarged can easily be reamed with a twist drill, when the desired size of reamer cannot be had. By procuring round oak plugs, turned to a driving fit, and driving these plugs into the hole to be reamed, the drill will be less likely to bind and wobble, and therefore less liable to breakage than when trying to drill the holes without the plugs.

An All-Metal Coat Rack

A clothes rack for the shop, which is very strong and durable and free from dirt-catching corners, is made as shown



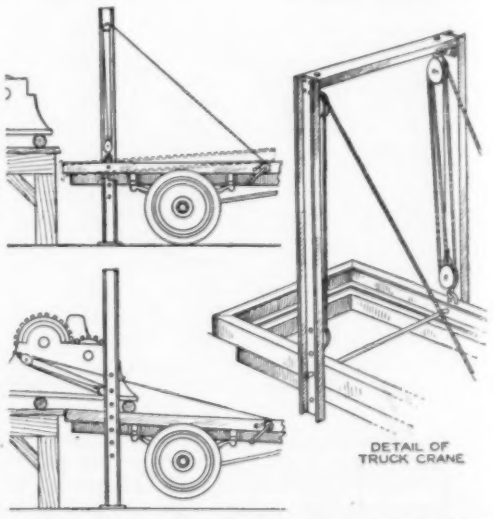
A Stout Sanitary Coat Rack is Readily Made in a Few Minutes from Three Pieces of Pipe, Some Wire Netting, and Scraps of Iron Rod

in the sketch. On a frame, consisting of three pieces of 1½-in. pipe screwed into flanges on the floor, is hung a length of poultry-wire netting to separate the garments hung on one side of the rack from those hung on the other. To the horizontal pipe are attached the hooks, which may be arranged in any of several different ways. The arrangement in the lower right-hand corner is simple, the hook consisting merely of a piece of ¼-in. iron rod, driven through a hole drilled in the pipe, and bent into shape with a hammer and round anvil. The hook arrangement in the left-hand corner gives greater capacity to the rack, but is slightly more expensive. With either of these types of hooks, it is advisable to put a pin through the elbow at one end of the horizontal pipe, so as to keep it from turning, in case one side should be overloaded with heavy clothes.

Crane at Rear of Truck Helps Load and Unload

For a truck man, or anyone engaged in general hauling, the idea of a crane built onto the back end of a truck presents great possibilities in the way of cutting down the time and number of men required for heavy jobs of loading and unloading. The frame of the crane may consist of two pieces of channel steel, long enough to reach from the ground up over the top of any load which may be expected to be carried on the truck; a shorter channel across the top of the two uprights, and a piece of flat sheet steel for the bottom. The first use of the crane, shown in the upper left-hand corner of the sketch, is to raise the rear end of the truck from the ground up to the height of the loading platform, whenever this is necessary. For this purpose, the pulley blocks, two at each side, are arranged as shown, and turning the crank at the right raises the truck to any height desired. Before this is attempted, the front wheels must be securely blocked, front and rear, since, with the rear wheels off the ground, the brakes on an ordinary truck are of no use.

After the truck is in position, it may be held there either by the rope, and the pawl acting against the ratchet, or by putting a pin across through the crane and the frame members. If it is held in the latter way, the upper pulley blocks can then be detached from the top of the crane, and the same tackle can be used to pull the load on or off of the truck, as shown in the lower sketch. Finally, after the job of loading or unloading is done, the upper pulley block may be shifted down to a hook on the bottom plate of the crane, and it can then be raised by turning the crank high enough so that the pin can be placed through the frame members, thus attaching the crane firmly to the truck for carrying. It is then swung down to the position shown dotted in the upper sketch, where it rests



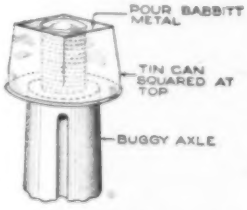
A Crane Attached to the Rear of the Truck Often Enables Two Men to Do with Ease What might Otherwise Be Slow and Difficult for Three or Four

securely during the haul, or until it is next required. At the right, the crane is shown in greater detail, and suggested

means of attachment are indicated; these will, of course, vary for different types of trucks. If the U-bolt illustrated is used for attaching the lower pulley blocks to the crane, it will be advisable to attach a similar U-bolt to the middle of the bottom plate of the crane, in order that the frame members may not interfere with the pulley blocks when the tackle is arranged for raising the crane to the carrying position. Dimensions and strengths of the various parts will have to be worked out for each case separately, as they depend on the size, weight, and character of the truck, and the nature of the loads expected.—F. F. Burnstead, Long Beach, Calif.

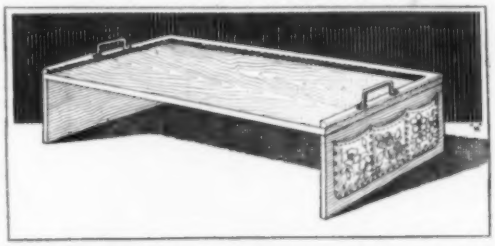
Emergency Nut Cast of Babbitt

When a nut, especially a large one of a certain size, must be had for repair work, and is not to be found, a good way is to make one from babbitt. In the case illustrated, a portion of a tin can was bent up to a shape approximating that of the nut desired. A hole was made to fit the thread of the axle, and the can was set in place to form a mold. After greasing the threads and the mold with an oily rag, babbitt metal was poured into the mold. When cool, the tin is torn away and a nut remains, which, if it has not the strength of a steel nut, will often give good service. The process is especially useful when a nut with a left-hand thread is required, as left-hand taps of the required size are less likely to be found handy than right-hand taps, while the babbitt nut can be used in either case.—W. J. Mahnke, Coeur d'Alene, Idaho.



Invalid's Table Rests on Bed

For the invalid who is able to sit up in bed, a great convenience is a table, or tray, made somewhat shorter than the width of the bed, with supports, 8 or 10 in. high, at either end, so that it can be set upon the bed directly over and in front of the patient. Three sides of the top are furnished with a narrow molding, and small brass handles attached at the ends. The wood may be stained and ornamental pockets made on its ends. These end pieces can be fastened to the top with nails or screws directly, and some form of blocks or braces should be used under-

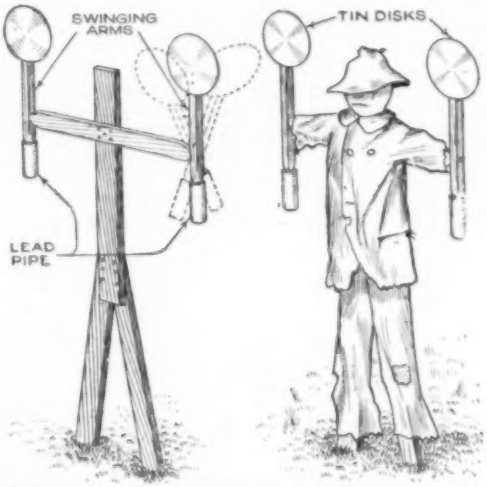


A Tray of This Type, Which Extends across the Patient's Knees, will Often be Found Handier Than Those Ordinarily Used in Hospitals

neath to strengthen the joints.—Mrs. G. E. Wilson, Boston, Mass.

A Scarecrow with Moving Hands

A scarecrow which, if not very lifelike, proved effective in frightening away the birds, was provided with "arms" to be revolved by the wind. On the ends of the crossbar were mounted two sticks of pine, 1 in. square. To one end of these sticks were fastened disks of bright tin, 7 in. in diameter; the other end was rounded off, and a piece of iron or lead pipe was driven on as a weight. The holes through these arms were placed at the points found by balancing the arms after the disks and pipe weights were applied; thus the slightest breeze would cause them to re-

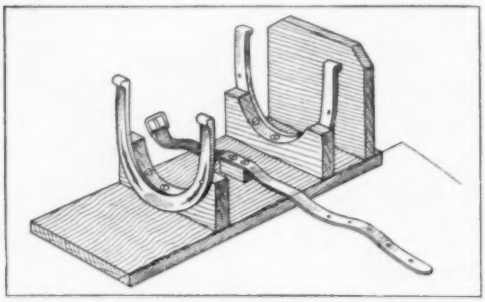


The Scarecrow Waves Its Arms with Great Rapidity Whenever a Slight Wind Blows, and Is Very Efficient in Keeping Away the Predatory Birds

volve. They will move somewhat more freely if washers are placed between them and the crossbar.—Sylvanus Van Aken, Port Ewen, N. Y.

An Asparagus Buncher

A handy rack for bunching and tying up asparagus, rhubarb, and similar garden produce, is made from two horseshoes,

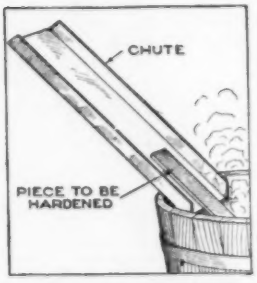


Vegetables, Such as Asparagus, are Laid in This Rack, Made from Horseshoes, and are Held with a Leather Strap While being Tied for Market

mounted on blocks of wood. The base should be about 8 in. wide and 13 in. long. A block, about as high as the horseshoe, should be used as a headboard. The horseshoes are nailed to two blocks, sawed out as shown, and a leather strap, tacked to the baseboard, will serve to hold the bunch while it is being tied. The ends of the horseshoes should be set out somewhat with a hammer before mounting, so as not to bend inward at the top. String cut to the right length is placed on the board before starting work.

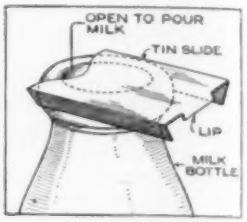
Hardening Long, Thin Pieces without Warping

It is difficult to harden a long, thin piece of steel without considerable warping. This is due to the cooling of different parts at different times, producing internal strains. If the red-hot piece is allowed to slide into the liquid on a chute held at an angle of about 45°, it will strike the water, end foremost, and cut into it at once. This gives better results than dropping it directly from the tongs, as the latter allows it to tilt, which will keep it from cutting in sharply and delay the contact of the liquid with some parts of the surface, thus causing warping. The chute may be a piece of scrap iron or tin, about 2 ft. long, bent up on two sides as shown.



A Milk-Bottle Cover

The thin tin boxes in which some kinds of fancy crackers are packed may be easily cut by scissors to make an excellent milk-bottle cover. Cut a strip a little wider than the top of the bottle, so that both sides may be bent down to engage the neck of the bottle, the tin being bent inward on an angle a little less than that of the wall of the lip. In cutting the ends of the tin, leave a lip or point on one end, to be bent down, and make an inward curve on the other end, to permit an opening to be made without removing the cover from the bottle.

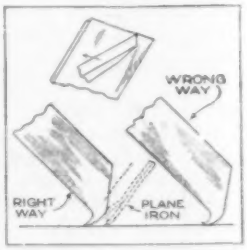


Magnetic Locator Useful in Wiring Finished Houses

A simple method of locating positions for openings in wiring old houses is that of using an ordinary magnetic compass, and a large, magnetized file. The file, which should be strongly magnetized, is driven into the ceiling at the point where it is desired to bore the hole. By moving the magnetic needle over the flooring above, it is possible to locate the desired position by the agitation of the compass needle.—Peter J. M. Clute, Schenectady, New York.

Good and Bad Scraper Edges

A great many carpenters have constant trouble in putting a good working edge on a scraper. This difficulty is almost always due to the curling of the honed edge while "turning" it, or, to use an inappropriate though widely employed term, "rolling" it. While it is quite difficult to learn to turn the edge of a scraper, anyone can easily rectify a poorly turned edge by straightening out the portion that has curled.

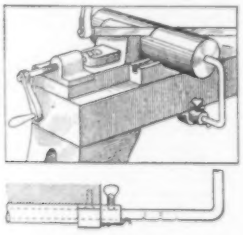


This is easily accomplished by running the sharp edge of a chisel along the inside

of the turned edge of the scraper. To do this, the chisel must be held at a very acute angle to the surface of the scraper blade, and at an angle of about 45° to the turned edge, holding the under, or flat, side of the chisel up and going along the edge lightly and without the use of any force. The sharp, honed, and perfectly straight edge of the chisel takes hold of the finest curled scraper edge. The angle used in the operation is very similar to that at which a plane iron is honed and set in the plane. The same scraper edge can be brought back to good working condition repeatedly by employing this process, which not only rectifies the edge, but also removes from it particles of wood, dust, and glue.—Henry Simon, Laguna Beach, Calif.

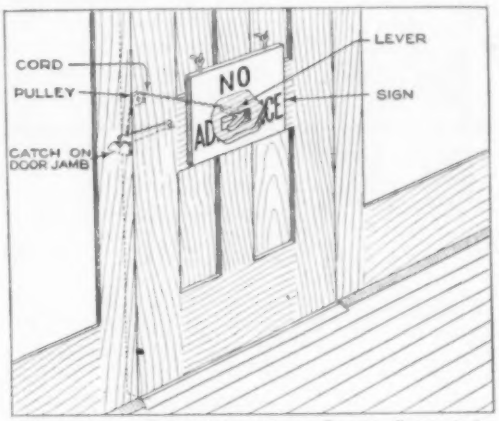
Measuring Gauge for Power Hacksaw

The ordinary forms of power hacksaw are not provided with gauges for determining the length of the pieces to be sawed, and the usual method is to measure the length required with a scale, and set the piece in the vise so that the saw comes at the proper point. In order that the hacksaw may be provided with its own measuring scale, a gauge like the one illustrated can be readily built onto almost any power hacksaw. A piece of thick tubing is held in metal strips, screwed under the frame of the machine, and a setscrew, of a form easily turned with the fingers, is threaded into this tube. For strength and durability, it is well to reinforce the tube at the point where the setscrew comes by driving on it, or soldering around it, a piece of larger tubing, or an iron strap, so that the screw will have a longer thread to work against. Inside of this tube slides a piece of round iron rod, which is bent to a U-shape, as shown. Upon it may be marked graduations to indicate directly the length of the pieces to be sawed off from the stock. It will also be found useful in many shops to add a spring and some notches in the rod, at a distance from each other of 1 or ½ in., so that the gauge may be easily set to these frequently used points.—C. Anderson, Worcester, Mass.



Door Latch Operated by Sign Reading "No Admittance"

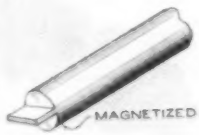
A factory made use of a novel device on one of its doors, which was intended for the use of employes only, although opening on a semipublic thoroughfare. There was on the outside of the door no knob or latch, and no other visible indication of how to open the door. The latch behind the door was, in fact, worked by a lever and cord, which was operated by pressure at the proper spot on the "No Admittance" sign. This was known to employes, and the secret can readily be discovered by anyone after gaining access, but the method by which the employes opened the door was far from being apparent to bystanders, and did good service in keeping out intruders.—H. F. Blanchard, Portland, Me.



The Door is Provided with a Latch Opened by Pressure on the "No Admittance" Sign, and the Stranger, Seeing No Means of Entrance, Is Forced to Obey the Sign

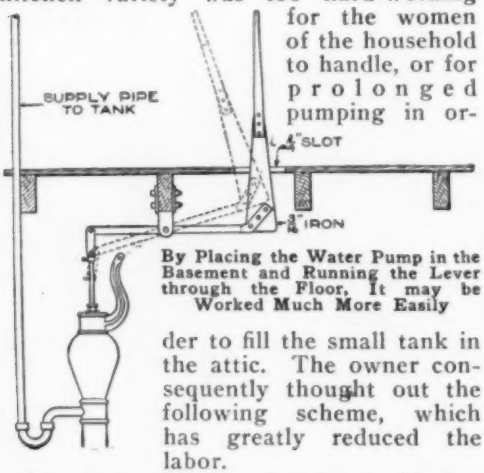
Making a Screwdriver Magnetic

Magnetized screwdrivers are useful for many classes of work, the carbon steel of which screwdrivers are made being capable of retaining considerable magnetism. A screwdriver which will retain a considerably stronger magnetism than an ordinary one, may be made from a round piece of tool steel, or preferably of tungsten steel, by simply grinding the end of a bar into the form of a very short screwdriver blade.—Maurice Clement, Youngstown, Ohio.



Long Lever Eases Action of Force Pump

A vertical force pump of the common kitchen variety was too hard-working for the women of the household to handle, or for prolonged pumping in order to fill the small tank in the attic. The owner consequently thought out the following scheme, which has greatly reduced the labor.

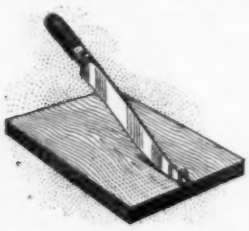


By Placing the Water Pump in the Basement and Running the Lever through the Floor, It may be Worked Much More Easily

The pump was placed under the kitchen floor, as shown, and the blacksmith made a lever from an old axle, somewhat of the shape illustrated. At the left end was placed a link, as in common pump jacks, and to it was fastened the upper end of the pump rod. The other end of the lever was riveted to a piece of sheet iron, and the handle was fastened to it. The lever was pivoted to the underside of a joist by means of an eyeplate and bolt. A slot in the floor allowed the handle to be swung back and forth. This slot was too narrow to permit mice to pass through, or much cold air to enter. Where 50 strokes of the pump was formerly quite tiresome, the operator can now take 500 without undue exertion.

Handy Kitchen Chopping Board

A handy chopping board may be quickly and easily made from a piece of hard wood, a pointed kitchen knife, and a large staple. The staple is driven into the edge of the chopping board far enough to set it firmly and at the same time to allow the point of the knife to fit into it. To operate, the knife is raised and lowered with one hand, while the food is passed under the blade with the other. Use of this device makes it easy to chop, slice, or mince, and there is little danger of the knife slipping, even though great pressure is applied.

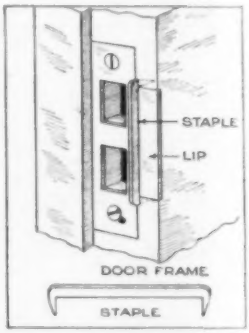


Nail Makes Satisfactory Plow-Plane Bit

When cutters of a special size are required for plow planes, a quick and efficient way to make them is to dress down a large nail or spike to the required shape. Although the adjustment of such a cutter will present somewhat greater difficulty than one of the ordinary type, its performance, if it is carefully made and sharpened, will be quite satisfactory for many purposes. Cutters up to ¼ in. wide can be made from 16, 20, and 30-penny spikes.

Staple Prevents Manipulation of Lock

Many doors which have been long in use have shrunk to such an extent that there is quite a space between the door and frame when the door is closed. Manipulation of the locks through this space is quite possible, especially where spring locks are used. An effective method of preventing this is to make a staple of sheet iron, long enough to take, between the two pointed ends, the lip of the striking plate. If this staple is then firmly driven in the position shown, it will be impossible to get at the lock to manipulate it.



Carrying Piano Made Easy by Handles

When a heavy piano is carried upstairs and down and from one place to another, injuries to the instrument and to steps and doorways will usually result. The difficult thing in the transportation of a piano is not in the weight but in the placement of the weight. A carrier which will reduce this difficulty is made easily from two 10-ft. pieces of 2 by 4-in. lumber. These are placed, one at the front of the piano, between the legs, and

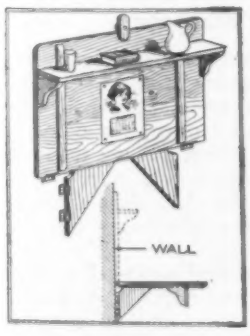
the other at the back of the instrument. Padding of paper or felt should be placed next to the piano to avoid scratching, and the handles should be bolted together by ½-in. iron bolts at either end. With the ends of the timbers shaved down to suitable size, six, or even four, men can easily move the piano.—William H. Leach, Alden, N. Y.

A Nonremovable Wood Screw

By filing off the head of an ordinary flat-head wood screw, as shown in the sketch, a screw is obtained which can be driven in with an ordinary screwdriver, but cannot be taken out except with great difficulty. While such a screw would be far from desirable in ordinary use, it is just the thing for attaching strap hinges, hasps, etc., where one wishes to make it difficult to interfere with the fastening. In driving ordinary wood screws, if the screw fits tighter than is anticipated, it is sometimes necessary to take it out and ream the hole, or use another screw. As such a procedure is not possible when using this nonremovable screw, it is advisable first to drive home an ordinary screw of the same size, then take it out and drive home the nonremovable screw.—A. B. Nutting, Boston, Mass.

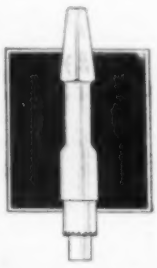
Folding Table Handy in the Kitchen

In a small kitchen, table space is often needed when it is not possible to keep a table of the desired size in the room permanently. A table top of the most useful size may be hinged to the wall, and supported when in use by brackets which also swing from hinges. The table top is held against the wall, and therefore out of the way, when not needed, by a wooden button. A shelf may be fastened to the underside of the table, which will be useful when it is folded up. If the device is well made it will be quite durable, and will not detract from the general appearance of the room.



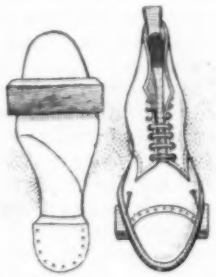
Saw-Tooth Counterbore Useful on Irregular Work

In repairing a broken casting in an almost inaccessible part of a traction engine, it was necessary to drill a number of 5/16-in. holes by hand, and as these holes were through a curved part of the casing, they had to be counterbored, so that the bolt heads would fit squarely. For such cases, the ordinary two-lipped pin drill does not work well when held in a brace. The tool illustrated was therefore made, consisting of a hollow bit with saw teeth filed in the end; after this has been hardened and tempered, the pilot is driven into place within the toothed circle. Such a tool is particularly effective in cutting brass. An objection to it is that it is difficult to sharpen, this being done by pulling out the pilot and sharpening the teeth with a stone, or with a file, if the tool is made of steel which is soft enough to permit this.



Wooden Blocks Keep Shoes Dry on Damp Floor

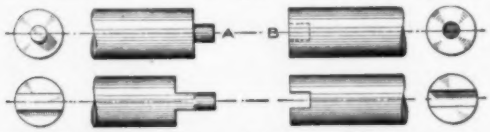
In order to keep his feet off of the floor, when required to work for a considerable time on a damp floor in a basement, a workman nailed strips of wood to his shoes, as illustrated. The result was entirely satisfactory, and his feet remained warm all through the day. The device is lighter than a good pair of overshoes and keeps the dampness out just as effectively, without injuring the ventilation and freedom of the feet. While wider blocks might provide slightly greater comfort, the advantage of the narrow ones is that very little dirt is collected, the feature of greater lightness also being of importance.—W. S. Hutton, Fornfelt, Mo.



A fisherman's sinker made of lead, with a nail set into the bottom, makes a very satisfactory plumb bob.

Making Tongue-and-Groove Joints on Shafting

In making tongue-and-groove joints on shafting, it is difficult to set the milling machine so as to get a very accurate



The Work of Making a Tongue-and-Groove Joint on Shafting is Easily Done by First Fitting a Plug into a Central Hole on the Other Shaft

alinement. The job may be made easier by first setting up the two shaft ends in a lathe, turning down a plug, A, on one end, and drilling a hole, B, to fit it on the other end. It is possible to do this work quite accurately. In cutting the piece on the milling machine, the circular work is used for gauging purposes. The groove is cut right through the hole B, and when the tongue is cut to the same thickness as the round plug A, this plug is cut off. This method enables a man of only moderate skill to do a very good job. —S. B. Royal, Reading, Pa.

Making a Small Milling Cutter

Making a special, or form, milling cutter, the teeth of which can be readily sharpened without modifying the form of the slot cut by the tool, is quite a trick in the home workshop, especially if one wishes to get the proper clearance angle on the teeth. One way of doing this is as follows:

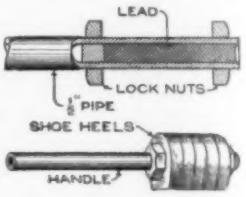
Turn out the blank from carefully annealed tool steel, and saw a number of equidistant radial slots, making twice as many of these as the number of teeth desired on the cutter. These slots should be cut in the milling machine with a standard saw, or thin cutter, and should be of the same depth, within a few thousandths of an inch. Now, with an old table-knife blade, or a piece of spring steel that will

Bending Back the Teeth before Hardening, and Breaking Out the Intervening Pieces before Tempering, Provide a Milling Cutter with Good Clearance

fit into these slots, bend every alternate tooth back until it touches the next tooth. Then harden the cutter, put it in a vise, and with a punch or nail set, knock out all the teeth that were not bent. The cutter is then ready for tempering to a straw color, and after this, for immediate use. Such a cutter may be sharpened exactly like a regular factory-made cutter. Somewhat better-shaped teeth will be produced if the slots are not quite radial, slanting backward just enough so that they will be radial after the teeth are bent. The exact placing of the slots depends on the material to be milled.—S. A. Asquith, Waterloo, Iowa.

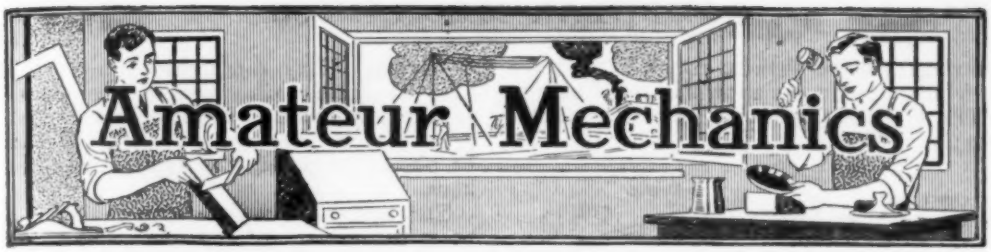
Substitute for Rawhide Maul Made from Shoe Heels

In view of the present high price of rawhide mallets, the kink illustrated may be of use to many machinists. A number of heels from old shoes are collected, the outer layers trimmed off if necessary, and a hole is drilled through them, large enough for a piece of ½-in. pipe. The end of the pipe is threaded in the lathe for a sufficient distance, and the pieces of leather are held clamped between two nuts. A hammer thus made will not be heavy enough for most purposes unless lead is poured into the end of the pipe, but with this addition, the mallet, although less durable than a rawhide mallet, will serve well enough at a much lower cost.



Electric Alarm Warns of Belt Stoppage

A jackshaft or conveyor, if driven by a belt, may give a warning of its own stoppage by the use of an electric-bell wire with push button, and over it a piece of slat, held up by a spring. Place these so that if the belt comes off, part of its weight comes onto the slat, thus depressing the push button and closing the circuit. This may be used with either horizontal, vertical, or inclined belts, provided the surroundings permit the installation of wires and push-button support at suitable points. More than one bell may be wired up, each with its own circuit and its own push button beneath the slat, or several buttons may be connected through the signal lights to the same bell. —J. E. McCormack, Haliburton, Ont.



Homemade Stringed Orchestra Instruments

By FRANK M. RICH

AN instrument which is similar to the samisen of the Japanese can be made of a cigar box, or other box of thin wood, a narrow board of 1-in. stock, some thumb tacks and screw eyes, and some fine piano or mandolin wire. The tools required are a plane, saw, jackknife, and something to start the holes for the screw eyes. A little glue will also be needed.

Saw the board for the neck piece as shown in Fig. 1. The lower part of this board is fitted inside the box; notice that this portion is cut away so that it touches the box at only two points. This is done to allow the head to vibrate as much as possible, and so produce a loud, full tone. A little care will be necessary in order to get a good fit everywhere. Be sure to make proper allowance for the thickness of the box. A square hole is cut in one end of the box, the neck piece inserted, and one end fastened with a screw eye, which also serves as a tailpiece to which

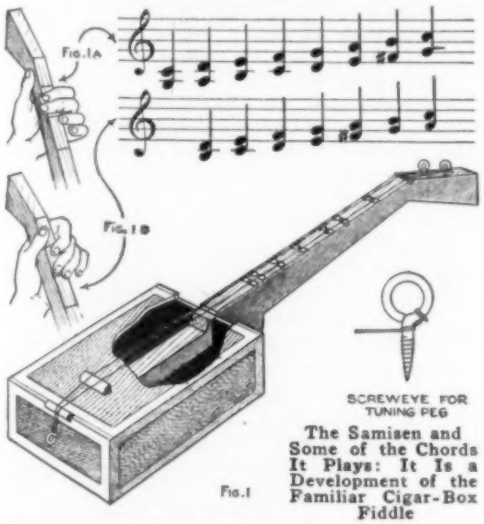
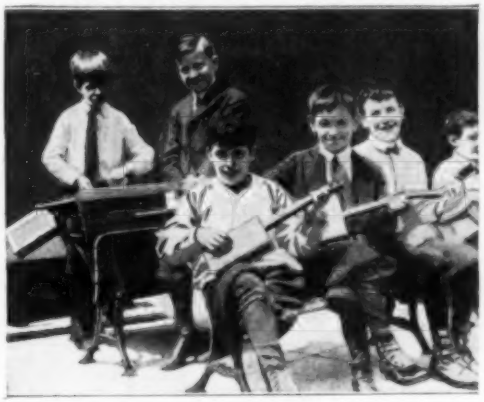


Fig. 1 **The Samisen and Some of the Chords It Plays: It Is a Development of the Familiar Cigar-Box Fiddle**

the strings are fastened; one of the cigar-box nails is driven through the head of the instrument into the neck piece, over the place where the hole was cut, to make everything firm and tight. If the neck piece is fitted quite accurately into the box, the results will be more satisfactory.



A Few of These Homemade Instruments will Furnish Amusement for a Long Time to a Group of Boys or Girls

The bridges, one on the box and one at the bend in the neck piece, should be whittled from hard wood, notched to keep the strings about ¾ in. apart. The depth of the notch in the little bridge (the one on the neck of the instrument) should be only a trifle higher than the frets, otherwise the strings will be stretched too much in playing the first fret, requiring the frets, especially the first, to be placed out of position, or else making the tuning of the instrument very bad. The big bridge is somewhat higher so that the string will not strike the second fret when the first is used; otherwise the tone will be "rusty." The same effect is produced unless the slots in both bridges are cut lower on the side next to the screw eye, so that the vibrating portion of the string meets a sharp edge, and therefore does not buzz against the wood. The finger board should be planed and sandpapered into perfect line; the back rounded; the bridges attached with glue; the two upper screw eyes inserted far enough from the bridge so that the

strings will be sure to touch it, and the strings attached as shown in the diagram. The frets are made by inserting thumb tacks at the points found to be the correct ones. Place the tacks in not quite straight, so that the string will be sure to touch the tack firmly at the edge next to its vibrating portion. This is to prevent rusty tones, as referred to above.

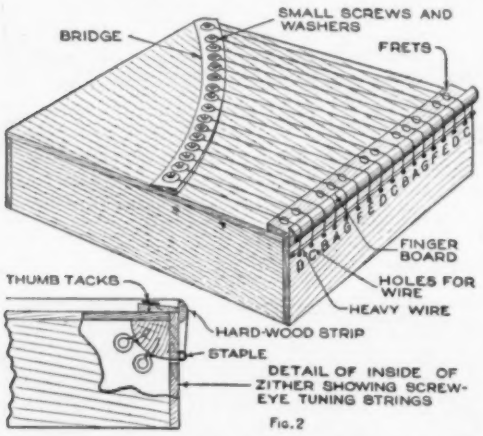


Fig. 2

The One-Fret Zither, is Made of a Somewhat Larger Box, and can be Played in All Keys

When played, the instrument is held in the lap, fingered with the left hand, and plucked with the thumb and first finger of the right. The farther string should be tuned to C, the nearer to G below it; or to some other two notes having the same interval so that they sound "do-sol."

The frets are placed so that, if the tone sounded by either string when open is called "do," the frets will give the notes of the scale, re, mi, fa, etc., up to the next "do," or even farther. The other string will then also give tones which make up a similar scale. Putting one finger across both strings, upon the same fret, gives the fourths, as seen in Fig. 1A, and the staff beside it. By placing the first finger on the outside string, first fret, and the second on the inside string, second fret, as in Fig. 1B, the thirds can be played.

These easy positions, in addition to the G string played open with the various frets of the C string, enable one to carry a very plausible alto part with no difficult fingering. The tacks used for frets are placed on the same level for both strings. This gives F sharp instead of F on the G string, and thus enables one to play minor passages on the G string corresponding to those played before on the C string. Easy modulations are taken care of quite well. Where a piano or other instrument is used for accompaniment, pieces in several different keys can be played by tuning the samisen to those keys.

The zither, Fig. 2, can be made of a box of thin wood of any size. The sound harmonizes well with that of the samisen, and a few of them, large and small, mixed in with the samisens, make a welcome addition to the orchestra of homemade instruments. The zither plays in any key, by pressing down the strings on the frets wherever the key calls for sharps and flats.

Since the strings should be nearly of the same tension, and as it may not be practical to get different sizes of wire, it is necessary to pay some attention to the length of the strings. The eighth string will be half the length of the first, and the fifteenth, two octaves above the first, will be one-fourth. The ends of the intervening strings will lie in a curve between. The curve need not be exactly correct, as the error in length of strings can be made up for by pulling some of these a little tighter than others. Lay off the curve on paper, then whittle, saw, or file out a hardwood bridge of the right size and shape, so that the ends of all the strings can be fastened to it by means of small round-head screws with small washers to match. This bridge will need to be beveled back a little, so that the vibrating portion of the string ends against a sharp edge, and therefore cannot buzz. The screws should be just long enough to go through the bridge and well into the wood without reaching the inside of the box. A little glue put on the bottom of the bridge, when the screws are inserted, will strengthen the fastening. Holes should be started with an awl or small drill, so as to avoid splitting. The wire is made into a loop, twisted a little for security, then held under the screw.

The finger board is a narrow strip of thin wood, either beveled to serve as a bridge, or having a strip of wood or metal for a bridge inserted at the edge. Another strip is glued to the end of the box, where the strings pass over the edge, to ease the strain on the strings in tuning, and to prevent the wires from cutting into the edge of the box. A piece piece of heavy wire, tacked along the end of the box, will serve the purpose.

Thumb tacks serve as frets, and are placed on the finger board, under C, D,

F, G, and A, one-sixteenth of the length of the string from the end bridge, to give the half-step notes, or the notes that are played by black keys on the piano. The screw eyes, used for tuning the strings, are set in a piece of quarter-round wood, glued inside the box, under the finger board. These tuning keys are placed in two lines for convenience, as they would otherwise be too crowded. The wires pass from the bridge to the screw eyes through small holes in the end of the box.

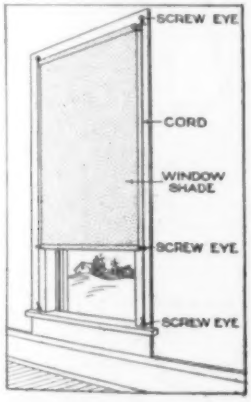
The zither is especially valuable to the student, as it plays in any key readily, and gives chords of two and three notes with pleasing effect. The fingering will be easily acquired, as there is only one fret to a string.

Drying Negatives and Prints Quickly

A photographic print can be dried quickly by artificial heat, but this method usually results in rolling up the films, which makes them inconvenient to handle. A method which is not open to this objection is to immerse the print in alcohol until it is saturated, and then allow the alcohol to evaporate. A glass negative can be dried in this way very quickly, and as soon as the alcohol has evaporated, prints can be made from it. Care must be taken to wash the films thoroughly before immersing in alcohol. Otherwise the emulsion will grain.

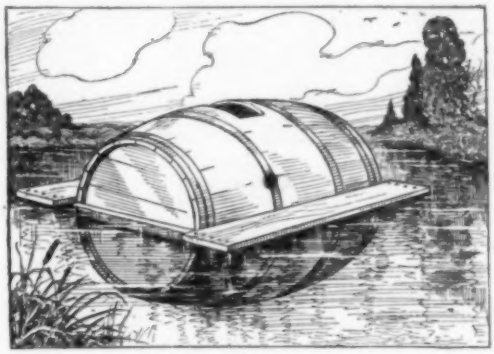
To Prevent Flapping of Shades

Window shades which are so located that in windy weather they flap in and out of the window are always injured by this action and speedily develop cracks or wear out. It is possible to rig up a guiding cord which will prevent entirely this flapping, and at the same time will not be so conspicuous as to injure in any way the appearance of the window. The method, which is similar to that widely employed in railway cars, is shown in the sketch; four small screw eyes, attached to the top and bottom of the window casing, have the ends of a cord tied to them and two more screw eyes are placed in the ends of the stick at the bottom of the shade. The cords pass through these two screw eyes, and the curtain can thus be raised and lowered as freely as before, the only effect of the cords being to prevent the shade from blowing out of place.—Mrs. Grace E. Willey, Concord, N. H.



Trap for Catching Muskrats Alive

In the spring, when green food is scarce, muskrats may be easily trapped for their pelts. These little fur-bearing animals abound in our small streams and marshes, and their hides find a ready and profitable sale. They are fond of green food, and, as this is scarce in the early spring, the rats enjoy eating such vegetables as carrots, apples, turnips, and other tempting bait.

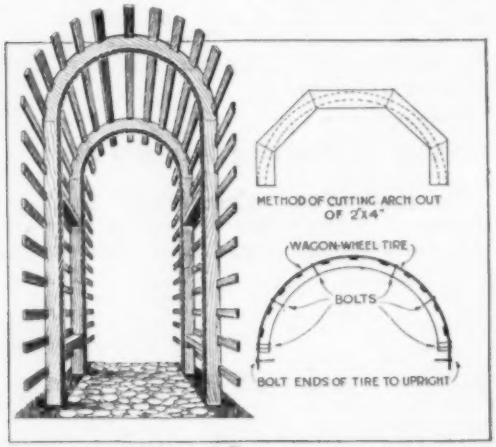


A Trap Made of a Floating Barrel Baited with Green Vegetables Catches Muskrats without Injuring the Pelts, Which Thus Bring the Highest Price

A homemade device for trapping these animals alive can be made from a barrel by cutting out a section of the staves, about 10 in. square, leaving the two barrel heads intact. Strong cleats are nailed to the ends of the barrel, with the ends of the cleats projecting about 6 in. on each side. On the cleats, boards 6 in. wide are nailed. The barrel is then filled with water until the boards on the sides are floating on the surface of the pond or stream, leaving about one-third of the trap above the water. The vegetables intended for bait are placed inside the barrel, where they will float on the water. The animal, attracted by this food, will jump into the trap where it will be imprisoned. The fur commands a much better price when the animal is trapped in such a way as not to injure the pelt.—H. V. Stanley, Chicago, Ill.

Wagon-Wheel Tires Form Garden Arch

An ornamental arch for the garden, on which a grapevine or other plant can be trained to grow, is made with the help of



A Steel Wagon-Wheel Tire Forms an Important Part of This Ornamental Garden Arch or Grape Arbor

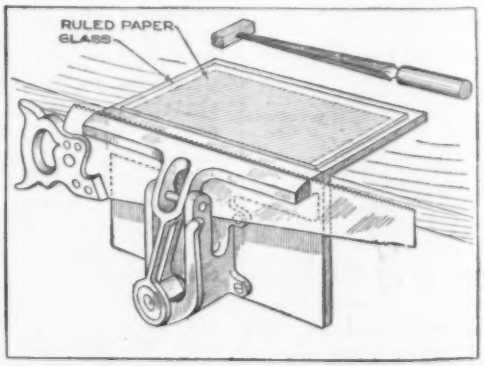
the two halves of an old steel wagon tire. The tire is cut in half, and a wooden backing for it is cut out of several pieces of 2 by 4-in. lumber, as indicated in the sketch. The dotted circles should be laid out with radii about 2 in. and 4 in., respectively, less than that of the wagon-wheel tire. When the tire is fitted to the outside of this curved wooden piece, there will then be a few inches hanging over on each end by which the tire is fastened to the uprights. The rails are laid in notches chiseled out of the wooden pieces, and the upper ones are held securely under the tire so that they cannot fall off, due to nails rusting out. The steel tire furnishes the strength of the arch, while the wooden backing furnishes stiffness and improves the appearance.—C. L. Meller, Fargo, North Dakota.

Ways of Filling Old-Style Fountain Pens

An old-style fountain pen may be filled in several ways, the regular medicine-dropper filler being handy, but not necessary. If a friend who owns a self-filling pen is near, his pen may be used in the same manner as the dropper. A good method for students or office people is to make a small funnel by rolling a piece of paper into cone-shape. This funnel must be held so as to leave room for the air to escape as the ink fills the pen. Another way is to dip a soda-fountain straw into ink, close the upper end, to hold the ink in the straw, place the end of the straw in the pen barrel, and remove the finger, thus releasing the ink. Repeat this until the pen is full.—J. W. Rodgers, Halifax, N. S.

Saw Filing Made Easy for the Amateur

Anyone can make an appliance that will not only be a help to the novice when filing saws, but may often make it easier for the expert. A saw clamp of any type is used to hold the saw. It is provided with a shelf, extending from the back and at right angles to the blade of the saw. A piece of glass, preferably about ¼ in. thick, is secured to the shelf in such a manner as to be easily raised. Three sheets of paper, the size of the glass, are ruled with heavy lines so that they can be plainly seen, when placed under the glass. One sheet has the lines at right angles to the saw blade, to be used when filing rip saws. Two sheets have the lines ruled at angles, those of one sheet slanting to the right and of the other to the left, according to the bevel it is desired to have the teeth for crosscutting. The file is prepared by driving its point into a small block, about 3 by 1 by ½ in. The lower face of the block is to rest on the glass, and is slightly rounded. The position of the corner of the file, with reference to the curved edge of the block, determines the rake of the teeth. When ready for use, the proper sheet is exposed under the glass. The file, when in use, should be kept parallel with the lines on the paper. Except when the teeth are very large, it



The Use of Guide Lines under a Sheet of Glass Makes It Easy to File Saws Properly

is better not to lift the block from the glass, but pass the file to the next tooth by raising the handle sufficiently.—W. R. Calver, Brooklyn, N. Y.

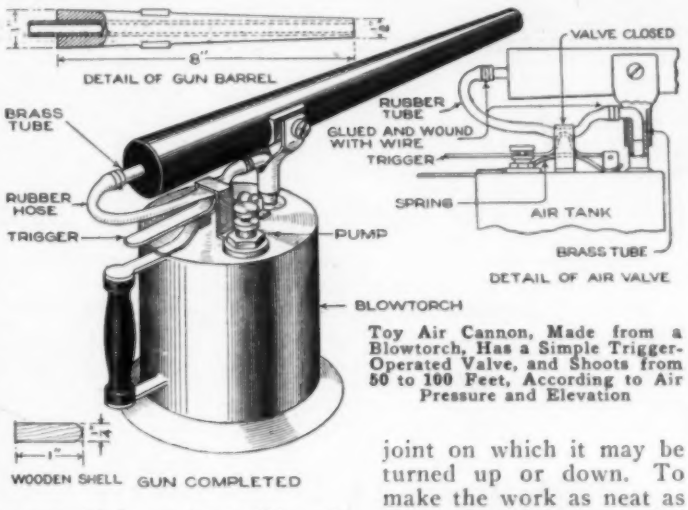
A Toy Air Cannon

By DALE R. VAN HORN

THE boy who has never owned a toy cannon that would shoot either accurately or with any length of range, will be well pleased with one which he himself can make, and which will far outshoot the average cannon sold in the stores. If the type of blowtorch used in the model described cannot be obtained, an excellent substitute may be constructed, using a bicycle pump to furnish the air pressure.

For the barrel of the cannon, a block of soft wood, 8 in. long, is required. In this a 5/16-in. hole is bored. To do this, clamp the block in a vise, and place the point of the bit in the center of the end. Then rest the forehead on the hand that holds the top part of the brace, so that it can be seen whether the hole is bored straight or not. Be sure to bore with the grain of the wood. After the hole is drilled, the block should be turned down in the lathe until the barrel has a diameter of 1 in. at the large, or breech, end, and tapers down to ½ in. at the small, or muzzle, end. If no lathe is handy the barrel may be cut out with a knife, and smoothed down with sandpaper, but in either case great care must be taken that the bore is exactly in the center of the stick. Since the hole in the barrel would be too rough for accurate shooting, a piece of ¼-in. No. 20 gauge brass tubing, 9 in. long, is driven into the bore from the breech, leaving 1 in. extending at this end. To finish the barrel, two wooden blocks, 1 in. long, ¾ in. wide, and ¼ in. thick, are cut to fit the curved surface of the barrel, and a ⅛-in. hole is drilled in the center of each. They are then glued to the stick, 2¼ in. from the large end, to serve as bearings. All the woodwork should be painted black.

Furnishing a support for the barrel is the next step. First the torch must be taken apart so that only the pump and the pipe projecting from the tank are left as they were. Then a piece of brass tubing, large enough to slip over the pipe and 3½ in. long, is slotted with a hacksaw for a distance of 2 in. Be sure that this cut is exactly in the center of the tube. The metal on either side of the cut is bent to a U-shape, to fit around the bearings on the gun barrel. In each arm a ⅛-in. hole is drilled, into which a screw, such as can be taken from a dry cell, is slipped, with the head outside. The hexagon nut belonging to the screw is tightened on the inside of the arm. These screws are to fit into the bearings on the barrel of the cannon, to make a swivel joint on which it may be turned up or down. To make the work as neat as possible, the edges should be rounded with a file. The support is then slipped over the pipe on the torch. It should be tight enough so that, while it may be turned, it will not come off easily. In this way the gun may be swung from side to side, but will not fall apart.



Toy Air Cannon, Made from a Blowtorch, Has a Simple Trigger-Operated Valve, and Shoots from 50 to 100 Feet, According to Air Pressure and Elevation

The remaining parts of the cannon are the connections which bring the air to the brass tube in the barrel, and an air valve operated by a trigger. A piece of ¼-in. brass tubing is packed tightly with sand to keep it from crumpling, and bent to a right angle. The sand may be removed by tapping the tube against a board. One end is slipped into the pipe on the torch, and fastened with glue or plaster of Paris to make it air-tight. This is the air connection from the tank of the torch. A piece of sheet metal, ½ in. wide and 4 in. long, is bent into a square "U," 1 in. high, 1 in. wide, and with two ½-in. projections, one from each arm, which are to serve as legs. The "U" is turned upside down and soldered to the top of the torch, 1½ in. back of the pipe. This forms the upper member of the pinch valve. The trigger is a piece of heavy brass, 4 in. long and ¾ in. wide,

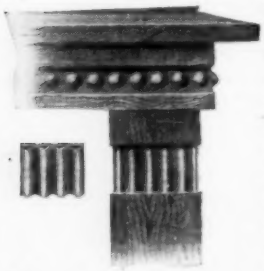
bent to shape. At one end, a shingle nail, with the head cut off, is soldered as a pin. Two bearings are made for the pin from sheet metal, each piece ½ in. wide and 1¼ in. long, bent to a right angle, ½ in. on one leg and ¾ in. on the other. A hole is bored in the long leg of each bearing to hold the shingle-nail shaft. Slip the bearings on the shaft, and solder them to the top of the torch, halfway between the pipe and the U-piece already soldered on. Be sure that the trigger moves freely on the bearing. A piece of a clock spring is then bent to the shape indicated, and its rear end soldered to the top of the torch so that it will hold the trigger up against the square U-piece.

To complete the cannon it is only necessary to place the barrel of the gun on its support with the screws in the holes in the bearings, and to connect the air line with a piece of rubber tubing. The spring in the brass supports will hold the barrel firmly in position. A piece of rubber tubing, about 8 in. long, will be required. This is connected at one end to the brass tube on the gun barrel, then threaded through the valve while the trigger is held down, and finally connected to the brass tube in the pipe. To hold the tubing firmly the brass tubes should be given a light coat of glue, the rubber slipped on, and the joint wound with wire. The cannon should not be used until this glue has set firmly.

For ammunition, wooden bullets are used. These may be cut from sticks of the proper size, or made in a lathe. The gun is very easy to shoot. After pumping the tank full of air, tip the barrel up and slip in a wooden bullet, then aim, and press the trigger. The bullet will be shot from 50 to 100 ft., depending on the air pressure and the elevation.

Paper Ornamentation in Amateur Cabinetwork

In order to introduce some ornamental effects in amateur cabinetwork, use may be made of some corrugated paper board, such as used for packing, and some strawboard which has small round studs embossed in it. Both are sunk well below the surface of the wood, in order to minimize the danger of marring them, and are firmly glued to the wood. Two or three coats of stiff shellac will do much to increase the firmness of the paper material, and if still greater strength is desired, the bosses and corrugations may be entirely filled with glue. It is not difficult to match the color of the strawboard to that of the wood, and the effect is quite pleasing. —W. H. Sargent, Rutland, Vt.

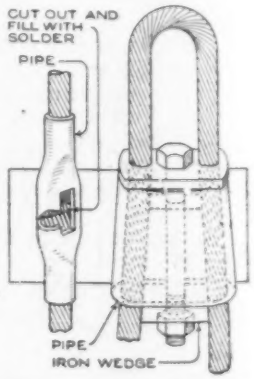


Novel Uses for Glass Push Pins

Glass push pins are particularly useful for temporary low-voltage wiring or amateur battery work. With them, wires can be run about the house without marring the woodwork or walls. After attaching pins at convenient distances, simply loop the wire once around each glass head, taking care to stretch the wire taut between pins. Two glass push pins, inserted so that they barely touch each other, make a toothbrush holder that is sanitary and individual. With a number of push pins, a holder for many brushes can be made.—Emile Parent, Ottawa, Canada.

Emergency Cable Fastenings

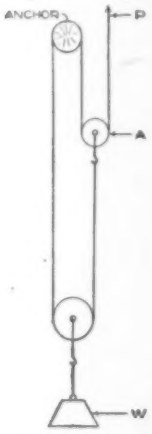
There are times when it is necessary to improvise a splice or an eye in wire cable, for the mechanic who is doing the work is sometimes not able to do a professional job of splicing. Use of pipe in making a substitute has proved practical, and may be adapted to the needs of the particular case. For a line splice, it is only necessary to take a section out of a piece of pipe; give it a bulge at this point; cut a hole in the side of the bulge; slip in the ends of the cable; separate them with a chisel through the hole, and pour hot solder into the opening. For an eye, provide an iron wedge, a piece of iron with three holes in it, a long bolt, and a



piece of flattened pipe. The cable is threaded through the two outside holes in the piece of iron, which should be of the proper size to serve as a cap for the pipe. Inserting the iron wedge and securing with the bolt makes a very strong eye which has plenty of strength for most guy wires and ordinary uses.

A Pulley Puzzle

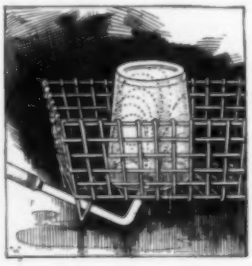
Many a youth who believes that he knows just how to figure the forces in ropes and pulleys may be puzzled by the combination shown. He will, of course, start out on the well-known principle that when a weight hangs from a system of blocks and pulleys, the force necessary to apply to the rope may be found by dividing the weight by the number of ropes supporting it. With this principle in mind he will at once say, on looking at the accompanying diagram, that the "power" P, supplied to the rope to raise the "weight" W, will be equal to ⅓ of W. Now call to his attention the fact that the rope below the pulley A must have twice the tension of the two ropes leading up from it, or 2P; also, that W must be twice the tension in the two ropes which directly support it, or 2×2P, which is equal to 4P. By this time he will be puzzled as to whether the rule about dividing the weight by the number of ropes isn't perhaps wrong. However, if he understands the principle involved, he will at length figure it out in this way:



The whole question is whether the circle marked "anchor" holds the rope tightly as if nailed on, not permitting it to move around in either direction, or whether the rope moves around it freely as through the pulley. In the first case, the rope at the left will have twice the tension of the other two ropes, so that W is equal to 4P, as explained above. In the second case, if we assume a free-running pulley as the "anchor," then a careful inspection will show what must immediately happen. The weight will fall, pulling the rope around the anchor, until the pulley A has been raised up to the level of the anchor. This simplifies the condition, as there are then only two ropes supporting the weight, and the tension on each of them, or P, is equal to one-half of it.

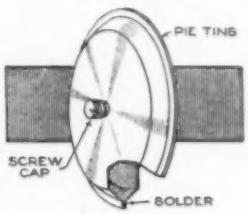
Bent Tube for Rinsing Dishes

Where wire dish drainers are used, instead of wiping the dishes off with a dish towel, it is often found convenient to use a rubber tube attached to the hot-water faucet for rinsing them. This does very well for china dishes, but spraying the cups and tumblers quickly so that they will drain off and dry is not so easy. A very convenient way is to arrange the drainer so that the bottom of it rests a few inches above the bottom of the sink, and set the tumblers and cups upon it directly inverted. In the end of the rubber tube, use a nozzle consisting of a piece of brass, or glass, tubing, 8 to 12 in. long, bent as shown in the sketch. By holding this nozzle in the position shown, the cups and tumblers are rinsed out thoroughly on the inside, and the same nozzle is equally useful for spraying the water from above on the outside of the cups, and on the other dishes.



Hot-Water Bottle Made from Two Tin Pie Pans

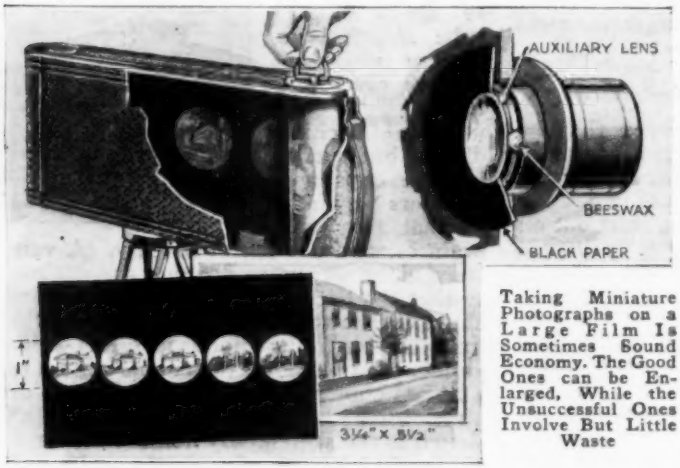
A very good substitute for a hot-water bottle, or bed warmer, can be made from two tin pie pans. In the center of one of the pans is soldered the screw top of an old oilcan. Take care that the screw cap has a good gasket so that it closes the opening with a water-tight joint. Solder the edges of the pans all around, and make sure there are no leaks. A somewhat more convenient arrangement is to place the screw top from the oilcan in the edge of the vessel thus formed, the edges of the pans being cut out to form the opening for it. This makes a rather more difficult job of soldering, but if skillfully done, it will make a more satisfactory job.—James E. Barkley, Detroit, Mich.



¶Tallow makes a very good substitute for oil in driving drift pins.

Taking Miniature Photographs

Any camera may be made to take smaller pictures than those for which it is built, by fastening an extra lens upon the rear face of the regular lens system. The results illustrated in this article were obtained with a camera designed to take pictures of post-card size, 3¼ by 5½ in. A thin, convex lens of 1¼-in. focal length was purchased from an optician, and was fastened, by means of two little pellets of beeswax at its margin, to the rear face of the regular photographic lens. If this auxiliary lens covers only the central region of the lens upon which it is fastened, it will be necessary to block off the light that would come through the ring outside the small lens, by a disk of black paper, with a hole in it slightly smaller than the extra lens.



Taking Miniature Photographs on a Large Film Is Sometimes Sound Economy. The Good Ones can be Enlarged, While the Unsuccessful Ones Involve But Little Waste

To obtain the correct focus, the bellows must be pulled out only a short distance, the true position being found by trial. The position may be located approximately by removing the back of the camera, stretching a piece of tissue paper across where the film runs, and focusing as upon a ground glass. The focusing position may be considered fixed for objects distant 3 ft. or more from the camera.

It remains to tell how to turn the film forward the proper distance, after an exposure is made. It is easy to distinguish, when looking through the little red window at the moving paper backing the film, just when the paper (and film) has moved a distance equal to the diameter of the window. (The grain of the paper is readily seen through the window, and the attention may be confined to a certain spot on the paper.) Move the film forward by steps equal to the diameter of the window—two, three, or more steps as the case may be. For instance, if the little pictures are 1 in. across, and the observation window is ½ in. in diameter, the film must be shifted, between exposures, a distance equal to two diameters of the observation window.

As an auxiliary lens one may, of course, use the lens found in the view finder of the camera. The resulting photographs will then be about the size of a dime. A useful lens is one of focal length approximately half the focal length of the regular lens combination; the pictures being then somewhat larger.

With this device objects only a few inches away may be photographed. For very near objects a focusing scale should be marked out by trial methods. Objects 6 in. distant may be photographed. The modified lens system is not, of course, a "corrected" one; all the usual aberrations of single lenses will be present. Nevertheless, many pictures taken by the method described will be so fine as to be well worth enlarging.

The scheme presents interesting possibilities when one finds himself with but one roll of unexposed film in a locality where no films may be purchased and where one "just must take a lot more photographs."—L. Pyle, St. Louis, Mo.

Foot Warmer for a Sidecar

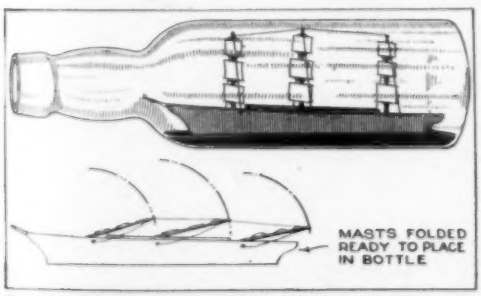
A satisfactory exhaust heater for a motorcycle sidecar was made from a one-gallon oilcan covered with asbestos. A round hole cut in the longer side of the can, which forms the bottom, has a brass tube, about 1 in. in diameter, fastened in it, which passes through the floor of the sidecar and serves as an outlet for the exhaust gas. Another hole in the side of the can nearest the engine receives a piece of flexible metal tubing which is passed through the floor, or side, of the sidecar and attached to the exhaust pipe, behind the muffler. It will not be necessary to have a valve, as the

apparatus can be removed when the weather is warm.—A. E. Crowther, Qu' Appelle, Sask., Can.

Putting a Ship in a Bottle

Many people, on being shown a full-rigged ship in a bottle, will naturally wonder very much how it got there. This novelty is quite easy to prepare, if one knows the right way in which to set about it.

A good-sized bottle, of clear glass, should be used. When this has been obtained, the hull of the vessel may be cut out. It is best to make this of a solid piece of wood. The ship should be perhaps an inch shorter than the inside measurement of the bottle, and of a proportionate width. At intervals, in the deck of the craft, rather large holes should be bored for the masts, which should be of such a length that there will be room for them inside the bottle when they are upright in the ship. Paper or canvas sails, and thread rigging can be glued onto the masts. Get some green paint, which is to represent the sea, and pour some of this into the bottle while it is held horizontally. The layer of paint should be about ½ in. in depth. Then, bend down the masts of the ship, and put some strong glue into the holes. With the masts bent over in the manner shown, it will be easy to push the ship down the neck of the bottle so that it settles into the layer of paint. It only remains to pull up the masts. This is easily accomplished by means of a bent pin on the end of a thin stick of wood. The glue, being stiff, sets quickly, and the masts are then permanently in an upright position. As the paint dries, this also holds the hull of the ship firmly, and,

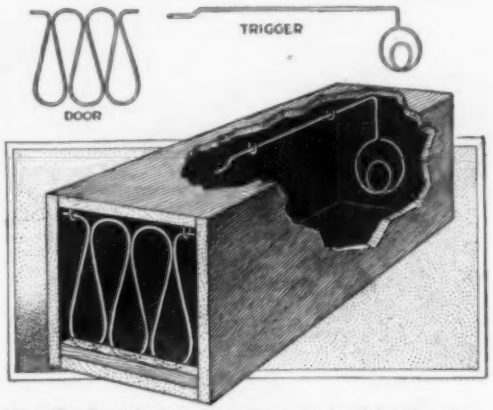


This Puzzling Ship-in-a-Bottle Novelty is Easily Made by Bending the Masts Over to Put the Craft in the Bottle

after a few hours, the bottle may be handled without fear of anything breaking away.—S. L. Bastin, Bournemouth, Eng.

A Practical Rabbit Trap

A practical and easily constructed rabbit trap consists of a wooden box, with a wire door which is closed when a wire



This Practical Rabbit Trap Resembles a Log, Requires No Bait, and does Not Injure the Rabbit

trigger is pushed by the rabbit on entrance. The box should be made of old boards, or new boards blackened with a stain not likely to offend the rabbit's delicate sense of smell. Five boards are required, two 1 by 6 by 22 in., two 1 by 8 by 22 in., and one 1 by 6 by 8 in. These are nailed together to form a square tube with the inside dimensions 6 by 6 by 22 in. One end is closed by the small piece.

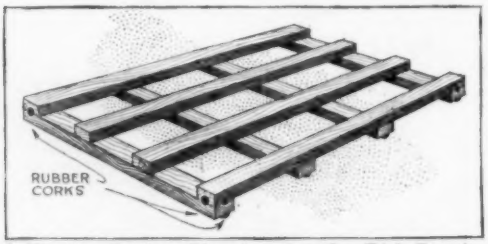
The door is made of heavy wire, hung loosely in the open end of the box from two staples. A small strip of wood must be fastened in the bottom of the opening to prevent the rabbit from pushing the door open when he is once caught. The trigger, also of wire, is hung from two staples in the top board of the box. The straight part of the trigger is 12 in. long, and the loop 3 in. in diameter. Be sure that the trigger is hung so as to slide freely through the staples.

In operation the trap is simple. It is set by pushing the door inward and upward against the top board of the box, and pulling the trigger forward until the door will rest on the hook.

Any green bait, such as lettuce, or a carrot, may be used, being placed in the closed end of the trap, but it is not absolutely necessary, the curiosity of the rabbit, and the likeness of the trap to a log being sufficient to attract him. As the animal enters the trap he pushes the loop of the trigger back until it releases the door, which falls behind him, leaving him a prisoner but uninjured.—Bertram Jackson, Logansport, Ind.

A Wooden Grating for the Sink

The wooden grating shown in the sketch, if used underneath dish pans and other large vessels in the sink, will go far



A Wooden Grating Placed under the Dish Pan in the Sink Keeps It from Knocking against the Sides of the Sink and Damaging the Enamel

toward preventing injury of the white enamel by the vessels knocking against it. The grating consists of four slats laid each way, about 1 by ½ in. in size. They are held together by nails, and are waterproofed with a coating of good waterproof paint or by immersing in hot paraffin. Small rubber corks should be sunk almost flush into holes bored in the ends and in the bottom of the grating, as an additional protection for the white-enamel surface of the sink.—Mrs. C. Michel, Jersey City, N. J.

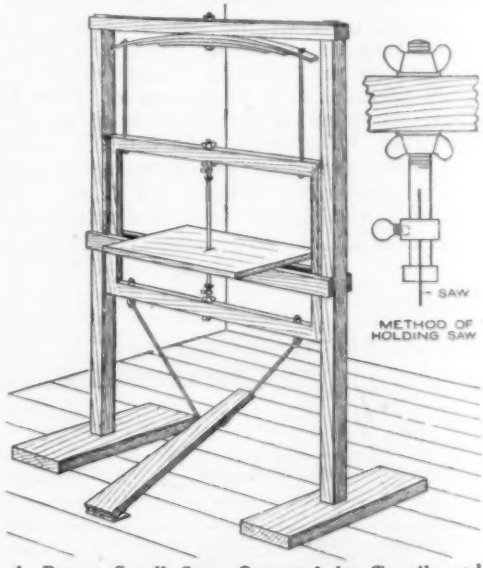
Cork Buffers on Medicine Cabinets Prevent Marring of Wall Paper

In hanging a medicine cabinet from picture molding, it is necessary to make the back hang parallel with the wall, and to protect the wall paper from the corners of the cabinet. Small corks, fastened to the corners on the back of the cabinet with screws driven through their centers, will fill both requirements. They should be countersunk so that the screw heads will not scratch the wall paper.

A Foot-Power Scroll Saw

The usefulness of the ordinary hand scroll saw is limited to the thinner, softer woods, and smaller work. A foot-power saw capable of handling large work, thicker and harder wood, and with less exertion, would for that reason be very welcome. Hard wood is best for the woodwork, but the better grades of soft wood will give good service. Two uprights, 7 ft. long and 3 in. square, are mortised at the bottom into heavy planks, screwed to the floor, the distance between the uprights being 4½ ft. They are connected at the top with a piece, 3 in. square and 5 ft. long, with mortised joints. The inner frame, which is to hold the saw, is made of two end pieces, 2 by 3 by 26 in., and two pieces for top and bottom, each 1½ by 3 by 54 in., held together with glue and screws. These top and bottom pieces are mortised into the sidepieces. A spring made of three pieces of ⅜-in. ash, planed to ⅛ in. at the ends, is fastened to the top beam with a bolt, and the ends are fastened to the saw frame with sash cord. The treadle is made from a board, 30 in. long and 1 in. thick, tapering from 4 in. wide at the rear end to 3 in. at the forward end. The wide end is fastened to the floor with hinges, and the narrow part is suspended from the saw frame by an iron rod, bent to shape and held by eyebolts. A table is provided to hold the work, 24 in. long, 18 in. wide, and 1 in. thick, with a 1-in. hole in the center for the saw to pass through. It is supported by two narrow strips, screwed to the uprights on each side of the saw frame. On each upright, two narrow strips are screwed, to serve as guides between which the saw frame will slip without swerving from side to side. This is necessary for accurate work.

Ordinary turning-saw blades, 18 in. long, are used. They are held in two ½-in. bolts, slotted by a hacksaw for a distance of 1½ in. from the head end. Collars provided with thumb bolts are



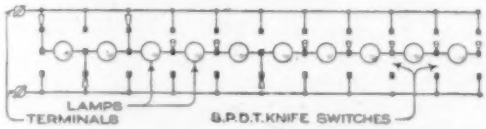
A Power Scroll Saw, Operated by Treadle and Spring, Handles Larger Pieces of Work Than the Hand Turning Saw

slipped over the slotted ends, and thumb nuts and washers added. The bolts are

placed in the center of the top and bottom pieces of the saw frame, and held by washers and thumb nuts. To put the saw blade in place, slip the ends into the slots of the two bolts, and fasten it by tightening the thumb bolts in the collars. The thumb nuts are then adjusted so that the blade is held rigidly in the saw frame. —Tod Masters, Ft. Atkinson, Wis.

Lamp-Bank Rheostat Permits Fine Adjustment

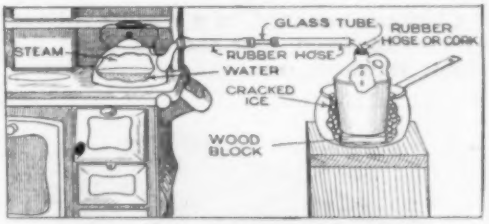
By using a number of single-pole, double-throw knife switches and lamp sockets, connected as shown, a rheostat of very flexible resistance is obtained, which is free from all short-circuit dangers, as the switches cannot be arranged to produce a "short." Another advantage of this type over the water rheostat, and even many of the carbon-disk resistors, is that the load is constant, so that the adjustment need not be changed during an experiment. By a simple manipulation of the switches it is possible to connect the lamps, all in series, all in parallel, or in any combination. Using 10 carbon lamps of the 110-volt, 32-cp. type, it is possible to obtain a current variation from 10 amperes down to one-tenth of an ampere. The sketch shows the first two lamps in parallel; the next three in series, but still in parallel with the first two; and the remaining five lamps disconnected entirely.—Victor H. Todd, Portland, Me.



Lamp-Bank Rheostat Which Permits Very Fine Adjustment, with Great Current Variation and without Danger of Short Circuit

Distilling Water without Special Apparatus

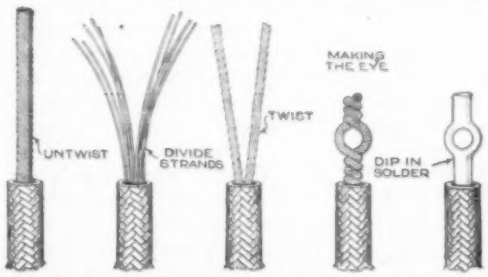
Distilled water is a necessity for the upkeep of storage batteries such as used in automobiles and farm lighting outfits, and is often recommended for the use of invalids where there are objectionable impurities in the drinking water. It is not necessary to purchase a still, in order to obtain water which is perfectly pure. The sketch shows how to rig one up from the objects shown. The essential principle of any still for this purpose is to present a cold surface where the steam may be condensed, and the resulting water collected. The jug surrounded by cracked ice provides such a surface, and it will be found that very little of the steam escapes condensation in the jug. If ice is not available, satisfactory results will be secured by the use of cold water around the jug, which, however, will have to be changed quite often, or kept steadily running. It is not advisable to use a metal container, as the purity of the water will not then be assured.—P. P. Avery, New York, N. Y.



An Apparatus for Distilling Water, Made from Familiar Objects Which Are Available in Nearly Every Household, will Provide Pure Water at Small Expense

Electrical Terminals Formed by Soldering

A satisfactory way of making a durable, efficient gas-engine ignition terminal is to form a solid loop at the end of the ordinary high-tension cable. The wire end is bared of the insulation for about 2 in., and the copper strands are untwisted and divided into two parts. Next, each of these sets of strands is twisted to make two large strands, after which the loop is made by twisting the two parts together for a short distance, then placing them around a small round rod and twisting the two ends together. The job is completed by dipping the loop in solder.

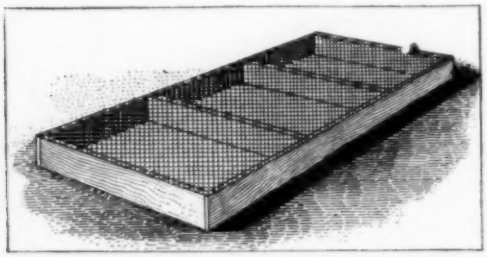


A Durable and Efficient Terminal for Ignition-System Connections is Made by Forming a Soldered Loop in the Wire

¶An ordinary lawn sprinkler may be used as a labor saver for curing concrete. It is only necessary to attach it to the hose and change its position occasionally.

Greens Protected While Growing in Chicken Yard

Chickens confined to a small yard eat everything green, root and all. But such plants as wheat, oats, barley, rape, clover,



A Frame Covered with Poultry Netting Protects Growing Plants, Which Furnish a Continuous Supply of Green Food for a Small Flock

alfalfa, and many of the grasses, may be grown in a chicken yard, and furnish the required amount of green food, if they are protected while growing. A plank, or board, frame, 8 ft. wide and 12 ft. long, covered with poultry netting, will protect the roots and lower parts of the plants so that they will continue to grow, furnishing a continuous supply of green feed. The ground should be enriched with manure before planting, and must be watered occasionally.

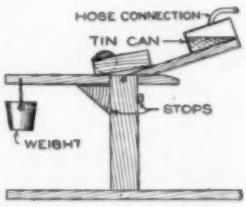
The small frame illustrated will furnish green food for only a few hens, but it may, of course, be made as extensive as circumstances require.—Herbert A. Shearer, Chicago, Ill.

Thermometer Mounted on Automobile

A thermometer, mounted in some exposed position on the automobile, will keep the driver informed as to when the radiator and hood should be covered, or when the antifreeze solution, or other such measure, becomes necessary. A good place to put the thermometer is on the windshield support, on the driver's side of the machine, as it is readily seen in this position, and will get the full force of the wind, which will aid it in indicating quickly the temperature of the surrounding air. The best type of thermometer for this purpose is one which is mounted on metal rather than wood, and has metal guards at the side to protect the mercury tube. Such thermometers are often sold for photographic purposes. Two wires, run through small holes in the metal back and fastened around the windshield support, will hold the thermometer securely. The thermometer is not conspicuous, but will often be found very handy for reference. —G. I. Mitchell, Pittsburgh, Pa.

Simple Mechanism for Providing Intermittent Motion

In some chemical experiments it was necessary to keep the contents of a bottle agitated at intervals over periods of several hours. The apparatus by which this was done may be useful for many other purposes, and its construction is shown in the sketch. A beam consisting of two sticks of wood, set together at an angle, carries at one end a weight and at the other a can of water with an open end. Leading to this can is a rubber tube through which a very small stream of water is directed from a faucet. The weight at the other end is such that when the can is empty, it is forced to the top position. As the water flows into it, a point is reached where its weight exceeds that on the other end; the can then falls to a position just below the horizontal, and the water is poured out from it. Immediately the weight returns it to the upper position and the process is repeated indefinitely. The bottle to be agitated was placed in a box resting in the position indicated, so that every time the can of water emptied itself, the bottle would roll to the other end of the box and back again, thus agitating its contents.



Various other uses for such an apparatus will occur to the experimenter, such as closing an electric contact at each movement and thus operating some mechanism which is being tested as to its durability under repeated use.—F. H. Mason, San Diego, Calif.

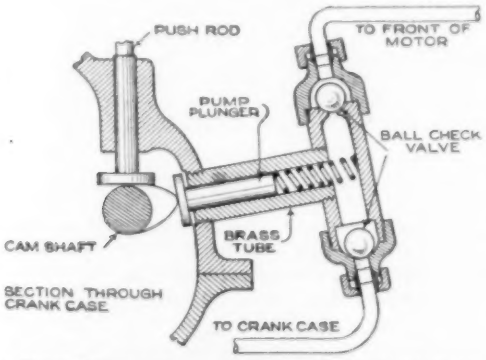
Convenient Type of Mail Box for Home Use

For those who have mail boxes flush with the side of the house, the following convenience is very practical. Cut out the back of the box with a can opener, and add about 5 in. to the body by solder-

ing. After cutting a hole through the entire wall and fitting the inside with a neat frame and glass door, the mail box becomes really a convenience. The mail is visible from the inside, and fussing with a mail-box key in disagreeable weather is eliminated.

Oil Pump for Automobile Engine

On an automobile engine which was oiled by the "splash" system, it was found that the tube which conducted the oil from the flywheel to the front part of the engine became clogged, and some burned-out bearings resulted. To prevent the recurrence of this accident, a pump was installed in the oil line and connected to be driven by the cam shaft, as shown in the sketch. The upper part of the motor crank case, on the camshaft side, was drilled out and tapped, opposite one of the cams, to take a brass tube, which was threaded with a standard pipe thread. This tube was reamed out to a snug fit for a small piece of shafting, which formed the plunger of the pump. Another piece of tubing was screwed onto the first, at right angles, and to the ends of it, through two ball-check valves, were attached the oil tubes leading to the crank case and to the bearings of the engine. These check valves acted to prevent oil from flowing back to the crank case, while permitting it to flow in the proper direction. On the end of the plunger was fastened a striking plate of hard steel, against which the cam pushed once during every revolution of the cam

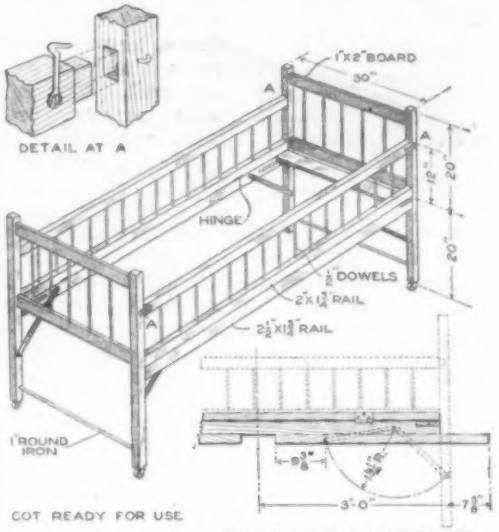


A Simple Plunger Pump, Attached to the Crank Case and Operated by One of the Cams, Provides "Sure-Fire" Oiling for the Auto Engine

shaft. In this way the engine was provided with a force-feed oiling system at small expense.—G. A. Luers, Washington, D. C.

Converting a Wire-Spring Cot into a Child's Folding Bed

A three-quarter folding bed can be assembled at very low cost by using a cot as a basis upon which to build. Even if



By Unfastening Four Screw Hooks, This Bed can be Folded Up So as to Occupy But Little Space

it is necessary to purchase a new cot, the expense will be attractively low. The sides are made of 2 by 1¾-in. rails, tied together with ½-in. dowel-pin spindles. These sides are hinged to the rails of the cot. The upper piece of each side is tenoned at A, as detailed, to fit into one of the end posts. A hook and screw eye is used to hold each tenon in place. The head and foot are identical in construction, and are hinged to the rails of the cot with the same strap-iron links which carry the legs of the cot. When it is desired to fold the bed, so that it can be concealed in a closet or under another bed, the hooks are released and the sides folded down on the top. Then the head and foot, swinging on the strap-iron links, are forced to a position under the cot frame. Thus the bed can be concentrated so that it occupies but little space. When building a bed like this, it will pay to purchase a good cot frame which has three wooden-slat cross bars, on each of which are four coil springs to assist in supporting the main spring.—R. J. Stephens, Kansas City, Mo.

¶A pair of friction-joint calipers opened out with one leg clamped to the blade of a try-square forms a useful surface gauge.

Mop Wringer Built in Bucket

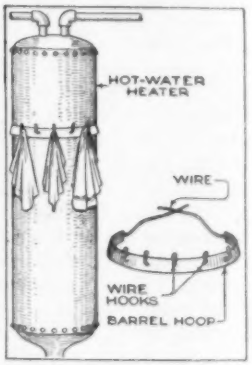
By fastening a galvanized clothes hook within a wooden pail, a satisfactory mop wringer may be easily constructed. Place the hook, with the opening down, about 4 in. from the top of the pail. Fasten with screws, or with round-headed bolts, making sure there are no sharp projections, and cut the bolts on the inside of the pail. Have the water level below the hook. The mop should be placed in the mop stick with both ends toward the handle, thereby forming a loop in the center to catch on the hook. Use the wringer by hitching the loop into the hook and turning the mop handle around. It will wring the mop as dry as desired, and the hands are kept dry. A galvanized pail may be used instead of a wooden one by having holes for bolts drilled through the side.

Milk Bottles Catch Pennies for Belgian Babies

An ingenious and attractive device for receiving money contributions on the street, or in hotel lobbies, for benevolent purposes, was recently devised in connection with the collection of funds for Belgian relief. The particular purpose of the money collected was to provide milk for Belgian babies, and the receptacles for the coins were milk bottles, painted white so as to look as though they were full of milk. Two bottles were mounted on a post, as shown in the sketch. They were fastened in such a way that they could not be detached without breaking the wooden pieces which held them, except by opening the box above, which was always kept locked. This box is used for displaying signs calling attention to the purpose for which the contributions are asked. By unlocking the cover and lifting from the inside of the box a block, which has a round handle projecting upward for this purpose, a pin is withdrawn from the center of the bar that covers the tops of the bottles, so that the bar can be slid out, permitting the bottles to be removed. This bar is provided with two slots for coins, one above each bottle. The person in charge of the collection carries the key which unlocks the door at the top of the post, giving access to the releasing mechanism.

Towel Rack on Hot-Water Tank

When there is a hot-water tank or reservoir in the kitchen, the warm, dry air around it is in splendid condition for drying dish towels, or other cloths, quickly. This may be taken advantage of by attaching directly to the tank a hoop, or ring, of metal, which may be readily made from a barrel hoop, and fastening in it as many hooks as one may care for. Stiff steel wire, or wire nails, make excellent material for hooks, and they can be riveted or soldered, or both, to the barrel hoop. The simplest way of attaching the hoop is to cut a piece long enough to go rather more than halfway around the tank, attach wires to the ends, and twist these wires together on the far side of the tank, which is not accessible enough to be useful for hanging the towels.—Warren F. Quackenbush, New York, N. Y.



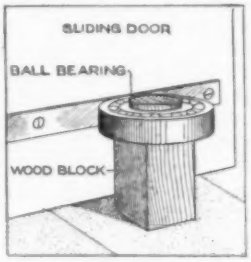
Keeping Phonograph Records Handy

In order that a disk-phonograph record might be picked out of the cabinet without the necessity of referring to the index, or reading the title on the record, one man made a number of folders about 12 in. square. These were of heavy wrapping paper. One edge was allowed to extend forward farther than the other, and to the outside of it was pasted an oblong piece of white, cloth-backed paper. On this the title of the record was written. As the filing folders ran from left to right in the cabinet, the oblong pieces

were pasted lower, in order to make the reading easy. This allowed them all to be in view. The longer edge of each folder made the filing and removing of the records easy. It would be possible to use the envelopes the records come in for the folders, but those made of heavier and wider paper are better.—Charles A. Goddard, Los Angeles, Calif.

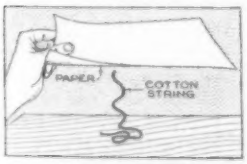
Old Ball Bearing Forms Door Guide

The sketch shows a novel door guide which was installed in a garage. It is made from a wooden block set into the floor and securely fastened. The upper end of the block is rounded off to fit an old ball bearing which had become too badly worn for further service in the car. A steel strap was screwed onto the door to protect against wear the part which would come against the ball bearing. If the block which carries the bearing is set into the concrete floor at the time the floor is laid, a very durable door guide is formed, and one which will not squeak or wear grooves in the door.—Frank W. Roth, Joplin, Mo.



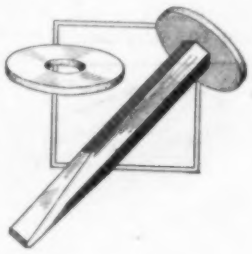
Paper and String Demonstrate Static Electricity

A most amusing demonstration of static electricity can be performed with a sheet of good-quality paper and a piece of ordinary cotton string. The string is laid loosely on the table, and the paper is electrified by rubbing it briskly with a piece of celluloid, a draftsman's composition triangle, or even with the hand. If the paper is immediately grasped and held a few inches above the string, the latter will leap up to meet the paper. By lifting the paper suddenly as the string rises up, a very comical effect is produced. The experiment depends very much on the dryness of the air and of the materials; it is impossible to perform any such trick when there is much dampness in the atmosphere.



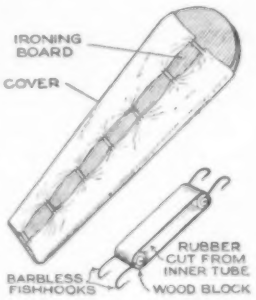
Hand Guard for a Cold Chisel

The use of a cold chisel by anyone inexperienced with it usually results in the hammer occasionally striking the hand instead of the chisel, with disastrous results. For the use of beginners, and possibly some of the older workmen who occasionally fail to hit the chisel directly on the head, it will be helpful to cut out a disk of old leather belting, make a hole of the proper size in the center, and mount it on the end of the chisel to break the force of any misdirected blow.—J. H. Williams, Baltimore, Md.



Ironing-Board Cover Made Easily Detachable

The cloth covering of an ironing-board is often permitted to become worn because of the difficulty of removing and replacing it. To avoid this, an ironing-board was fitted with a detachable cloth covering, as shown in the sketch. Four barbless fishhooks, four small wood screws, two short, round pieces of wood, and a section of a bicycle, or automobile, inner tube compose each of the fasteners. As many can be used as are found necessary to hold the covering securely to the board; when it is to be removed for cleaning, the hooks are detached at both ends of the fasteners, thus leaving the covering without any fastenings, which might get broken or injured during the washing.

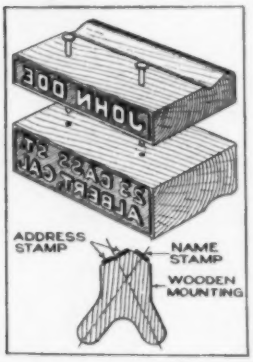


Stains on Photographs after Fixing

The brown or yellow stains, which are sometimes found on photographic prints after being taken out of the fixing bath, can be prevented by mixing a tablespoonful of vinegar in the water in which the prints are washed after being developed.

Rubber Stamp Made in Two Parts

Anyone who does much corresponding will find it convenient to have a small two-line rubber stamp with his street and city address, and will also have frequent use for another stamp to print his name only. For still other purposes, it is useful to have all three lines in one stamp. This can be accomplished without having three separate stamps, by mounting the two first-named stamps on rectangular blocks of wood, and fitting them together as illustrated. Two small nails are driven through the thinner mount and fit into holes in the other one. These holes may be made by means of the nails themselves, as the set should be a tight-working fit. In this way, either stamp can be used by itself, or the name block can be attached to the address stamp by merely pressing the two nails into the holes, thus forming practically one stamp. The nail holes must, of course, be located while the two stamps are clamped together in the proper position, so that their printing surfaces are exactly in the same plane.



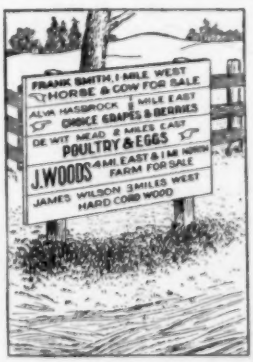
Another way of doing this is to mount the name stamp and the address stamp on the same block, but on surfaces at an angle with each other. When the name and address are both to be printed, the stamp is inked by a rocking motion on the pad, bringing both parts of it into contact with the inking surface, and the impression on the paper is made with a similar motion. If the angle at which the two stamps are placed is correct—it should be about 120°—it will be found that the combined impression can be made in a time scarcely any longer than that necessary to use an ordinary stamp. Then, when either the name or address is wanted separately, it can be printed in the ordinary manner by turning the stamp to the proper angle. A handle, or molding of the mounting block to the shape shown, will be found convenient, as it will help in holding the stamp correctly, but this will not present any difficulties after a little experience in using the stamp. This method of mounting the rubber stamps may also be found useful in an office for various other combinations of words.—H. R. Dunn, Chicago, Illinois.

Repairing Broken Canoe Paddles

The blades of canoe paddles crack and break very easily. Around a boathouse they soon accumulate, representing a good deal of waste. To the private owner a broken paddle often means that he must stay off the water for several days. The ordinary method of repairing, by using copper strips, is not pleasing to the eye, and does not lend itself to the emergency need of the private owner. A strong, quickly made repair can be effected by using double-pointed tacks. These should be large, strong tacks of brass, or at least galvanized. After clamping the parts of the blade together as tightly as possible, drill very small holes on each side of the crack, spacing each pair of holes to the width of the double-pointed tacks. The tacks are put in, and clinched, using them alternately on each side of the blade. In case the paddle has a thin strip broken off one side of the blade, it may be advisable to drill 1/16-in. holes from the side, through which thin wire nails are driven, double-pointed tacks being used after the strip has been nailed to the blade. Repairs made with tacks and nails as suggested have actually kept paddles in use for years after the first break, without requiring additional mending.—Roy B. Snow, Toronto, Can.

Crossroads Sign Goes after Business of Motorists

Many farmers are becoming very much alive to the fact that it is profitable to sell their produce direct to passing motorists. Fair prices can be had in this way, and there is no expense for transportation or delivery. A number of farmers in one locality attracted a considerable amount of this kind of business by erecting a signboard where two automobile highways crossed, which advertised their location and what they had for sale. The device was apparently ap-


FRANK SMITH, 1 MILE WEST
HORSE & COW FOR SALE
ALVA HASBROCK 1 MILE EAST
CHOICE GRAPES & BERRIES
DE WIT MEAD 2 MILES EAST
POULTRY & EGGS
J. WOODS 4 MI. EAST & 1 MI. NORTH
FARM FOR SALE
JAMES WILSON 3 MILES WEST
HARD CORD WOOD

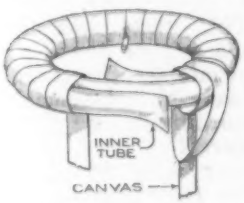
preciated by motorists who happened to be looking for the products which were mentioned on the signboard.—H. S. Rich, Hartford, Conn.

Filtering River Water for Drinking Purposes

It sometimes becomes necessary to drink river water. A fairly safe way to do this, if there is no opportunity to boil the water, is to strain it through cotton. Get a piece of ¼-in. rubber tubing, several feet long. Form a cup by taking half of a rubber bulb or some other material convenient at hand. Fill the bulb with cotton batting, and place the bulb end in the water. The water drawn through the tube will be clear, and much purer than without the filter.—James E. Noble, Portsmouth, Ontario, Can.

Air Cushion for Invalid Made from Inner Tube

An automobile or motorcycle inner tube, which has blown out in one or two spots without losing entirely its ability to hold air, may be made into a pneumatic cushion for the use of an aged person or invalid, by simply cutting it in two at one of the weak spots, vulcanizing each of the ends, repairing any leaks or holes, and forming the tube into the shape illustrated. It should be wound, while inflated to a low pressure, with strips of stout canvas or burlap; the pressure can then be increased to whatever is required. Some motorcycle tubes are manufactured with closed ends, and these are especially adapted for this use

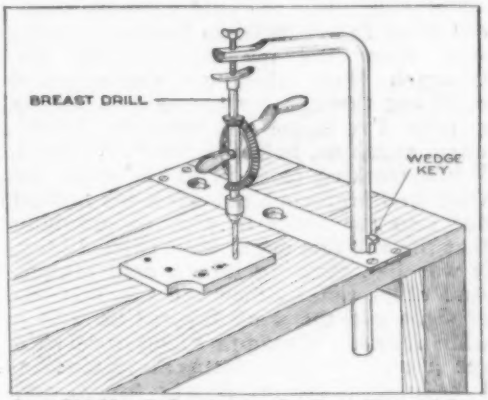


An Improvised Pendant Switch

A pendant switch, which is even more convenient than most of the manufactured ones, is formed by screwing a fuse plug into an ordinary pull socket. The switch thus formed must, of course, be connected in series with the light, or lights, to be controlled, and not across mains like a lamp socket. Any key socket can be converted into a pendant switch in this way, but the type operated by pulling a chain makes a particularly convenient switch.—Loe Addy, Newcomerstown, Ohio.

Drill or Brace Made More Effective by "Old Man"

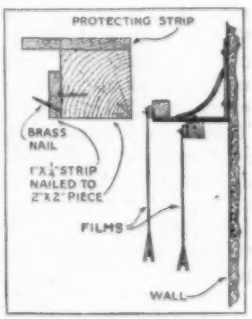
A simple rigging, as illustrated, for the amateur's workbench, will frequently enable him to use his bit brace, breast drill, or a hand drill with almost the effectiveness of a drill press. The only change necessary to make in the brace or breast drill is to cut a center in the top, to take the point of the feed screw. The "old man" is made of an iron bar, or pipe, fastened in a bar, set into the bench by means of a wedge key, and may be quickly adjusted to various heights by releasing the latter. The bar may have several holes cut at different places to receive the bar or pipe, so that it can be set in various positions.—Chas. H. Willey, Concord, N. H.



An "Old Man," Consisting of a Bent Piece of Iron Bar or Pipe, Applies Great Force to the Bit Brace or Breast Drill

Quick Method of Hanging Up Films to Dry

When a number of roll films are being dried after developing, the time necessary to hang them up and remove them is quite appreciable. One of the quickest methods of hanging them is to have a number of brass nails in strips of wood mounted along the wall, as shown. If there is any danger that a person may run against these projecting nails, the strip should be covered with another strip of wood or iron.



DIVING FOR DOLLARS OFF ALASKA

By WILLIAM FLEMING FRENCH

"IT wasn't so bad during flow tide, but at ebb, when the cold currents swept out from Prince William Sound, carrying with them the icy waters from the Chugach Mountains, my nerve oozed right out through my diving suit. Many a time I've come up into the bright, warm sunshine, half paralyzed with cold. While working close in to the shore we were well protected, but when we worked out into the strait to pick up anything that the ebb tide might have carried back, it was like jumping into a cold plunge. And other times, when the sun was out of sight and the wind favored us with a whiff from up Hanagita Valley way, we'd get a chill straight from the Klondike, I believe. Anyhow, it was tough, and we'd never have stuck if the pickings weren't worth it."

This from one of the adventurous divers who were diving for dollars off Cordova, Alaska. A half dozen of them there were, and they had reaped large rewards for their daring—for diving in treacherous Alaskan waters is no gentle pastime. The millions of dollars' worth of unsalvaged ships and cargoes that lie off the rocky shores of the gulfs, bays, and sounds of Alaska prove that.

One small diving boat, operated by two men, cleared $1,400 in three days at this work. Others did almost as well. They were not diving for pearls, nor for gold, but for copper.

Because of the dangerous nature of the Alaskan waters, and because of the great ebb and flow of the tide at Cordova (due to the fact that the two islands that lie just off Cordova form a sort of natural runway through which the receding tide must race) the loading of copper from the great mines thereabout, onto the ships that carry it to the States, has been a risky business. As a result thousands of bags of copper were lost between the edge of the loading dock and the boats. These small, cube-shaped bags, weighing in the neighborhood of 50 lb. each, were at one time tossed from the wharf to the ships, later swung in by a loading crane, but now are loaded by a protected device whose nets eliminate the chance of a repetition of these losses.

But the harm had been done and, according to the estimates of one shipping agent there, over 50 tons of good Cordova ore lay on the bottom.

Then the prices began to soar, and in early 1916, when the allies were paying over 30 cents a pound for it, the 10 and 12-cent ore that had been lost a few years before looked like a gold mine to the mining and shipping interests of that territory. So steps were taken to reclaim the lost ore. A diving crew was employed and set to work.

This seemed to have the effect of the good old-fashioned gold rush. Individuals started diving—and specializing in pneumonia. Then up from Seattle came a couple of diving outfits, and another appeared from down Sitka way. More followed, and soon quite a little fleet was operating. Not always exactly within the law, perhaps, but certainly with great enthusiasm.

The ore lay mostly close to the docks, and this, of course, was salvaged by its legitimate owners. But hundreds of sacks had been forced up the narrow passage to the northeast by the incoming tide, or else dragged out into deep water by the outgoing waters. This, then, was the natural "game" of the private diver.

Due to the constant milling of the sand, many of these bags were buried, some at great depth, and, according to one diver, could never be recovered.

The bags of copper were found, in some instances, miles from the docks; and in one case, a half dozen bags were found on a bar just off Hinchinbrook Island, fully 12 miles from Cordova.

Just how much of this ore, in dollars and cents, has been reclaimed, no one seems to know, but an estimate, that is generally accepted as fairly reasonable, sets it at about $25,000.

GREATEST OF BRITISH MINTS ARE IN INDIA

The mints of India, at Bombay and Calcutta, together turn out more coins than all the other mints in the British Empire, it is claimed. This surprising output is easily accounted for when it is understood that not only do they supply the coinage demands of the 315,000,000 people in India but also of several other British possessions, including Egypt and the Straits Settlements. Furthermore, among primitive peoples coins are used to a greater degree than by the inhabitants of the more advanced countries.